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Useful plants of Namaqualand, South Africa: A checklist and analysis

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ABSTRACT

A comprehensive checklist of 2902 vascular plant species for Namaqualand (Western and Northern Cape Provinces of South Africa) is presented, in which the local traditional and contemporary human uses of 384 taxa are indicated. Information was obtained through a literature study and extensive field survey work, including rigorous and detailed interviews and field walks. Of the total of 383 useful plant species, 240 are used in traditional medicine, 185 are edible, and 216 are used in crafts and other miscellaneous uses. Several species are used in more than one of the three main use categories. A total of 119 vascular plant families is represented in Namaqualand, of which 78 include species that are used locally for medicine, food and crafts. Species from 66 families are used for medicinal purposes, 53 include edible species and 57 include species used for crafts and other miscellaneous uses. The families that contribute the highest numbers of useful plant species are Asteraceae (51 spp.), Geraniaceae (23 spp.), Aizoaceae (22 spp.), Apocynaceae (18 spp.), Iridaceae (17 spp.), Asphodelaceae (13 spp.), Fabaceae (13 spp.), Lamiaceae (11 spp.), Apiaceae (10 spp.) and Amaryllidaceae (9 spp.). There are 45 new species-records of plants with human uses and 147 newly reported uses (38 medicinal, 51 edible and 58 crafts and miscellaneous uses). The checklist was used for a regression analysis of the total number of available plant species per family (as independent variable) and the total number of species per family that are used in Namaqualand (as dependent variable). Residual values of predicted vs actual numbers of species show an over-representation of especially Asteraceae (+21), Geraniaceae (+16) and Apocynaceae (+11) and an under-representation of Aizoaceae (−17), Hyacinthaceae (−7) and Poaceae (−6). The inventory data and results are not only of importance in understanding the broader plant use patterns of the Khoi-San legacy in the Succulent Karoo Biome, but also contribute to the conservation of the cultural heritage of the people of Namaqualand, and as a source of ethnobotanical data for future research and comparative analyses.

1. Introduction

San hunter-gatherers were the first inhabitants of southern Africa (Schapera, 1930; Boonzaier et al., 1996; Compton, 2016) and preceded the Khoi, who had a pastoral-nomadic lifestyle, by many thousands of years. The earliest evidence of herding dates back to around 2000 B.P. (Boonzaier et al., 1996; Compton, 2016). The largest division of the Khoi people was the Nama group (Boonzaier et al., 1996), who inhabited the western coastal area of southern Africa (including the northwestern part of South Africa and southern Namibia), an area called Namaqualand, Greater Namaqualand or Namaland. The southern part of Namaqualand that falls within the borders of South Africa was historically called Little Namaqualand but nowadays simply Namaqualand (and also hereafter in this paper). This was the study area of the current study. The Nama people practiced transhumance and possessed fat-tail sheep and oxen and lived in the traditional Nama huts made from reed mats (*matjieshuise*, *rondehuise* [Afrikaans] or *omi* [Nama]) (Schapera, 1930; Van der Merwe, 1945; Boonzaier et al., 1996; Webley, 2007;). Historically the Nama people spoke the complex click langue called *Khoekhoegowab,* also known as Nama (Haacke and Eiseb, 2002).

Namaqualand is a semi-desert area of almost 55,000 km^2 along the Atlantic coast of South Africa and is famous throughout the world for its spectacular display of flowers during spring (August–September). Succulent Karoo is the dominant biome in Namaqualand, but the areas of Fynbos Biome occur along the central and southern coast, in the central mountainous Kamiesberg region, and on the higher peaks of the northern Richtersveld (Adamson, 1938; Mucina and Rutherford, 2006; Desmet, 2007). Namaqualand can be divided into five distinct ecogeographic units, namely the Knersvlakte, Sandveld, Hardeveld, Gariep and the Kamiesberg area (Snijman, 2013). The region is well known for its marked summer aridity and high level of species richness, with close to 3000 recorded plant species, including a large number of endemic plant species (Van Wyk and Smith, 2001; Manning, 2008; Snijman, 2013).

The urgent need for documenting the traditional ethnobotanical knowledge of the Khoi-San people has been emphasised in several publications (e.g. Liengme, 1983; Van Wyk, 2002; Van Wyk et al., 2008;

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De Beer and Van Wyk, 2011; Nortje, 2012). The Khoi-San possess a fragile oral-traditional knowledge system that is currently under threat due to profound changes in lifestyle and the adoption of Western cultural practices.

It is noteworthy that the first documented ethnobotanical study in South Africa was done in Namaqualand, during the journey of governor Simon van der Stel in 1685 (Van der Stel, 1685; Skead, 2009). Various studies such as those by Laidler (1928), Schapera (1930), Archer (1990, 1994), Goldberg (1998), Steyn (2012), Wheat (2013) and Nortje and Van Wyk (2015) contributed to what is currently known about the ethnobotany of the area. Flower- and ecoguides also provide some information on the local uses of plants (Eliovson, 1972; Le Roux and Wahl, 2005; Manning, 2008; Le Roux, 2015). All plant uses documented in the literature were recorded.

Various hypotheses have been proposed for explaining how and why particular plant species are selected by a culture (Gaoue et al., 2017). One hypothesis is that the selection process had resulted in medicinal or edible plant species numbers per family that are not in proportion to the number of locally available species per family. This concept of non-random plant selection can be explored through regression analysis of the species diversity of plant families and those species selected for use (Moerman, 1979, 1991, 1996). Moerman (1979) showed that the traditional uses of North American medicinal plants are non-random and that some families have much higher or much lower numbers of useful species than what a regression analysis would predict. The reasons why some species are preferred above others are not always clear. Laidler (1928), for example, indicated that the Nama people of the Kamiesberg chose some of their plants according to what is known as the 'doctrine of signatures', based on the idea that some conspicuous traits of a plant give clues to how it can be used. Red roots, for example, were used for wounds and blood-related ailments. Plant life forms are clearly of importance, with fleshy geophytes and leaf or stem succulents likely to be selected for food, grasses and reeds for crafts, shrubs and trees for firewood and construction (with bark for making ropes and for tanning leather). The hypothesis of non-random selection does not explain how and why particular plant species are selected but merely examines whether species are selected in proportion to their numbers in a plant family, i.e. it examines relationships that are the outcome of the selection process. The comprehensive checklists for both the entire vascular flora and the ethnobotanical flora of Namaqualand, (as presented here) provide, for the first time, the necessary data for a similar analysis for Namaqualand.

A comprehensive quantitative ethnobotanical study of Namaqualand is currently in progress. All previously documented plant uses in literature, enriched through numerous interviews with local participants in Namaqualand, are presented here as a detailed inventory of the useful plant species of Namaqualand. The inventory not only makes a contribution to the cultural heritage of Namaqualand but will allow for more detailed comparative studies by future researchers.

2. Materials and methods

A comprehensive species checklist (inventory) of 2902 vascular plants of Namaqualand was compiled and arranged alphabetically by family and genus (electronic supplement, Appendix A). The list includes 12 species with more than one infraspecific taxa listed (nine subspecies and three varieties), so that there are 2902 species but 2914 taxa. The list of useful plants (Table 1) also includes a few varieties and subspecies, all except one of which represent a single infraspecific taxon and therefore referred to (and counted as) species. The only exception is *Lessertia frutescens* (L.) Goldblatt & J.C.Manning, where the two subspecies were counted as one species. The publication of Snijman (2013) was the main source of taxonomic data for this list, for which we selected only those species occurring in the five ecogeographic units of Namaqualand, namely the Knersvlakte, Sandveld, Hardeveld, Kamiesberg and Gariep regions. All entries were checked against the Newposa database (2019) (http://newposa.sanbi.org/Explore), especially to update name changes that have occurred since 2013. A few additional species were recorded during our own surveys, with voucher specimens (and photographs of the plants) depicted in Nortje (2012). Specimens were compared with the collections in the Compton Herbarium of the South African National Biodiversity Institute at Kirstenbosch Botanical Garden in Cape Town. Useful naturalised exotics (indicated by an asterisk* in Appendix 1) were added, as well as some ethnobotanically relevant species indigenous to South Africa that do not occur naturally in Namaqualand (indicated by a double asterisk**). The plant family classification used here is that used by Snijman (2013) except for recent changes as provided by the Newposa database (2019). (See Appendix A.)

A summary of the main uses of the species is presented in Table 1, based on a comprehensive literature survey and new data from own interviews. Uses were broadly classified as medicinal, edible and crafts (including other miscellaneous uses). Medicinal uses include the ailment categories as outlined by the Economic Botany Data Standard, n. d. (http://www.kew.org/tdwguses/index.htm), plant species used for veterinary ailments, as well as "magic" medicines (so-called *paljas*). Edible uses also include thirst quenchers and plants used as ingredients or ferments for making beverages. Crafts and other miscellaneous uses include what is classified in the Economic Botany Data Standard as environmental uses (construction), fuels and animal fodders. The main literature sources of ethnobotanical knowledge were Van der Stel (1685), Laidler (1928), Schapera (1930), Archer (1982, 1990, 1994), Whittaker and Archer (1985), Goldberg (1998), Skead (2009), Steyn (2012), Nortje (2012), Wheat (2013), Nortje and Van Wyk (2015) and Le Roux (2015). It is difficult to ensure that all species identifications in the literature were accurate, especially when no voucher specimens, illustrations or photographs were provided in the original texts. However, the majority of ethnobotanically relevant species are relatively well known, with well-establised local vernacular names. Although care was taken to try and verify the identity of historically recorded species, the possibility that some species were misidentified cannot be ruled out. We used the Newposa database (2019) to check the status of all the entries and to verify all accepted names and synonyms.

Interviews were conducted in 16 communities in Namaqualand, with more than 120 participants contributing to the knowledge. The main participants are listed alphabetically by surname (with written consent from all of them) in the footnotes of Table 1, together with their places of origin in Namaqualand. All interviews were done in Afrikaans, the mother tongue of both the researchers and the participants. Only a small number of Nama speakers were encountered, but most of them also spoke Afrikaans. Both Afrikaans and Nama vernacular names were recorded. For the latter, sound recordings were made to allow for correct future transcription and spelling. The rapid ethnobotanical appraisal method (Martin, 1995) was followed by the matrix method of De Beer and Van Wyk (2011). The main research instrument for the interviews was a flip-file with composite photographic plates of known useful plant species, selected on the basis of the literature and the initial rapid appraisals. The flip-file and matrix method ensured rigorous and systematic documentation in an area of high seasonal variation, and when working with older, less mobile participants. It also ensured that false-negative data were minimised, because the visual cues reminded participants of plant species that may otherwise have been temporarily forgotten. False-positive data are less likely because vernacular names and associated plant uses can be verified against what were previously and subsequently recorded in various regions of Namaqualand (and the extent to which it agrees with literature data). Field walks and collection of voucher specimens were done in cases where the identity of plant species needed verification or confirmation (voucher specimens are housed in JRAU). Ethical clearance for the interviews was obtained from the Ethics Committee of the Faculty of Science, University of Johannesburg (Protocol of 13 January 2015). All interviews

Table 1
Checklist of useful plants of Namaqualand (including one lichen and one seaweed). All indigenous and naturalised plant species with uses in Namaqualand are listed (species with recorded uses elsewhere are not included). Naturalised exotics are indicated by an asterisk*; South African indigenous species that do not occur naturally in Namaqualand by a double asterisk**.
The literature references are grouped according to the three main categories of use – M: medicinal, E: edible, O: crafts and other miscellaneous uses. The survey data were obtained through interviews and ethnobotanical field work. All participants who contributed use-records and their home towns are listed below (full details of the use-records will be published elsewhere).

	Family	Species (45 species with newly recorded uses in Namaqualand in **bold**)	Literature references of all recorded uses in Namaqualand (in chronological order)[a]	Survey data[b] (147 newly recorded uses[c] in **bold**
1	Acoraceae	**Acorus calamus* L.	**M:** G2, Q1, W1, S7, C1, R6, H1, V8, N2; **E:** C1; **O:** C1	M
2	Agavaceae	**Agave americana* L.	**M:** W1, A7	
3	Agavaceae	**Agave sisalana* L.	**M:** W1, A7	
4	Aizoaceae	*Carpobrotus edulis* (L.) L.Bolus	**M:** P3, D2, M4, L1, S2, W1, W5, C4, S7, M5, R3, P1, P1, P1, R4, J1, J1, R5, A6, R6, P2, H1, A1, V5, V5, S3, V9, V7, V8, D1, N2, W3, A3; **E:** A4, A6, L2, A3, N2, S10, W3	M, E
5	Aizoaceae	*Carpobrotus quadrifidus* L.Bolus	**E:** A2, N2	**M**, E, **O** (fodder)
6	Aizoaceae	*Cheiridopsis denticulata* (Haw.) N.E.Br.	**E:** N2; **O:** L2, W3	**M**, E, O (fodder, social)
7	Aizoaceae	*Conicosia elongata* (Haw.) N.E.Br	**M:** N2; **E:** N2	E
8	Aizoaceae	*Galenia africana* L.	**M:** K2, L1, S2, W1, S7, K1, A5, A1, C5, V5, V10, A2, V9, V7, D1, N2, W3, A3 W4; **O:** A6, S1, W3	M, O (fodder, firewood, construction, household, hygiene)
9	Aizoaceae	*Leipoldtia schultzei* (Schltr. & Diels) Friedrich	**O:** W3	
10	Aizoaceae	*Mesembryanthemum barklyi* N.E.Br.	**O:** A6, V5, M2	**M**, **E**, O (fodder, household, hygiene)
11	Aizoaceae	*Mesembryanthemum crystallinum* L.	**M:** P3; **O:** M4, L1, A5, A6, A3, N2, V5	M, **E**, O (fodder, household, hygiene, social)
12	Aizoaceae	*Mesembryanthemum guerichianum* Pax	**O:** M2, N2	**M**, **E**, O (fodder, household, hygiene)
13	Aizoaceae	*Mesembryanthemum junceum* Haw.	**M:** K2; **O:** V5, N2, M4	M, O (construction, hygiene)
14	Aizoaceae	*Mesembryanthemum noctiflorum* L.	**O:** W3	O (firewood)
15	Aizoaceae	*Mesembryanthemum pellitum* Friedrich	**O:** A6	
16	Aizoaceae	***Mesembryanthemum rapaceum*** Jacq.		**M**, **E**, **O** (fodder)
17	Aizoaceae	*Mesembryanthemum sladenianum* L.Bolus	**O:** A6	
18	Aizoaceae	*Mesembryanthemum subnodosum* A.Berger	**O:** A6	
19	Aizoaceae	*Mesembryanthemum tortuosum* L.	**M:** V4, P3, M4, L1, S2, G2, W1, S7, E1, A6, R6, A1, C5, V5, S3, V8, N2, W3, A3	M
20	Aizoaceae	*Polymita albiflora* (L.Bolus) L.Bolus	**M:** W3; **O:** W3, S1	
21	Aizoaceae	*Ruschia robusta* L.Bolus	**O:** S1, W3	
22	Aizoaceae	*Stoeberia beetzii* (Dinter) Dinter & Schwantes	**O:** A6	O (firewood)
23	Aizoaceae	***Stoeberia utilis*** C.H.Wright		**O** (firewood)
24	Aizoaceae	*Tetragonia echinata* Aiton	**O:** L3	
25	Aizoaceae	*Tetragonia fruticosa* L.	**M:** W3; **O:** W3	**E**, O (fodder)
26	Alariaceae	*Ecklonia maxima* Panenf.	**M:** V2; **E:** V3; **O:** V3	M, E, O (social, environmental)
27	Alliaceae	*Allium synnotii* G.Don (= *A. dregeanum* Kunth)	**E:** M5, A6, V5	**M**, E
28	Alliaceae	*Tulbaghia alliacea* L.f.	**M:** P3, K2, W1, G2, W5, B1, R2, P1, J1, E2, P2, H1, V5, S3, V7, V9, V8, A3, N2; **E:** P1, N2	M, E, **O** (environmental)
29	Alliaceae	*Tulbaghia dregeana* Kunth	**M:** A6	M, **E**
30	Alliaceae	***Tulbaghia violacea* Harv.	**M:** P3, V5, V8, A3; **E:** V8; **O:** V5, A3	M, E
31	Amaranthaceae	**Atriplex lindleyi* Moq.	**M:** M5; **O:** L2	O (fodder, social)
32	Amaranthaceae	****Atriplex nummularia*** Lindl.		**O** (fodder, firewood)
33	Amaranthaceae	*Hermbstaedtia glauca* (J.C.Wendl.) Rchb. ex Steud.	**M:** N2; **E:** A6	M, E, **O** (fodder)
34	Amaranthaceae	*Manochlamys albicans* (Aiton) Aellen	**M:** W3; **E:** A6; **O:** A6, L2, V5, A1, W3	O (fodder, hygiene)
35	Amaranthaceae	*Salsola aphylla* L.f.	**O:** M4, S7, V5, W4	O (fodder)
36	Amaranthaceae	**Salsola kali* L.	**M:** W3; **O:** W3	
37	Amaranthaceae	*Suaeda plumosa* Aellen		O (fodder)
38	Amaryllidaceae	*Boophone disticha* (L.f.) Herb.	**M:** M4, K2, R6, V5, M2, V8; **O:** M4, S5, V5, M2	M, O (fodder)
39	Amaryllidaceae	*Boophone haemanthoides* F.M. Leight	**O:** S5, N2	O (fodder, household)
40	Amaryllidaceae	*Gethyllis afra* L.	**M:** V5, W3; **E:** V5, W3; **O:** V5	
41	Amaryllidaceae	*Gethyllis britteniana* Baker	**M:** P3, K2, A2, N2; **E:** M4, L2, A2, N2; **O:** N2	M, E, O (hygiene)
42	Amaryllidaceae	*Gethyllis ciliaris* (Thunb.) Thunb.	**E:** A6	E, **O** (hygiene)
43	Amaryllidaceae	***Gethyllis grandiflora*** L.Bolus		**E**
44	Amaryllidaceae	***Gethyllis villosa*** (Thunb.) Thunb.		**E**
45	Amaryllidaceae	*Haemanthus coccineus* L.	**M:** P3, L1, V5, S3	M, **E**
46	Anacampserotaceae	*Anacampseros papyracea* E.Mey. ex Fenzl	**M:** A1; **E:** M4, A6, R6, V5	M, E
47	Anacampserotaceae	***Anacampseros prominens*** G.Will		**E**
48	Anacardiaceae	*Ozoroa dispar* (C.Presl) R.Fern. & A.Fern.	**E:** A6; **O:** A6, N2	E, O (household, social)
49	Anacardiaceae	**Schinus molle* L.	**M:** W1, G2, S7, V11, J1, V6, V7, N2; **O:** N2	M, **E**, O (firewood, household, environmental)
50	Anacardiaceae	*Searsia burchellii* (Sond. ex Engl.) Moffett	**M:** J1, A6, A6, A3, N2; **E:** A6, A3, N2; **O:** A6, A3	M, E, O (firewood, household)
51	Anacardiaceae	*Searsia horrida* (Eckl. & Zeyh.) Moffett	**E:** A4; **O:** A4	
52	Anacardiaceae	*Searsia incisa* (L.f.) F.A.Barkley	**O:** A5, L2	
53	Anacardiaceae	*Searsia pendulina* (Jacq.) Moffett	**M:** A6; **E:** A5, A6; **O:** S7, A5, A6	

Table 1 (*continued*)

	Family	Species (45 species with newly recorded uses in Namaqualand in **bold**)	Literature references of all recorded uses in Namaqualand (in chronological order)[a]	Survey data[b] (147 newly recorded uses[c] in **bold**
54	Anacardiaceae	*Searsia populifolia* (E.Mey. ex Sond.) Moffett	**E:** A6; **O:** A6	**M**, E, O (fodder)
55	Anacardiaceae	*Searsia undulata* (Jacq.) T.S.Yi, A.J.Mill. & J.Wen	**M:** L1, A5, R6, A3, S1, V5, N2, W3; **E:** A6, R6, N2; **O:** A5, V5, N2, W3	M, E, O (firewood, environmental)
56	Apiaceae	*Anginon difforme* (L.) B.L.Burtt	**M:** N2	M
57	Apiaceae	*Annesorhiza altiscapa* Schltr. ex H.Wolff	**M:** A6; **E:** S7, A6	E
58	Apiaceae	***Annesorhiza* sp. nov. 1**		**E**
59	Apiaceae	***Annesorhiza* sp. nov. 2**		**E**
60	Apiaceae	*Bupleurum mundii* Cham. & Schltdl.	**M:** H1, N2	
61	Apiaceae	*Chamarea capensis* (Thunb.) Eckl. & Zeyh.	**M:** R6, S3; **E:** A6, V5	
62	Apiaceae	*Cynorhiza typica* Eckl. & Zeyh.	**E:** V5, N2	E
63	Apiaceae	*Deverra denudata* (Viv.) Pfisterer & Podlech	**O:** A6	
64	Apiaceae	*Notobubon pearsonii* (Adamson) Magee	**M:** N2	
65	Apiaceae	*Polemanniopsis marlothii* (H. Wolff) B.L.Burtt	**E:** A6	
66	Apocynaceae	*Asclepias crispa* P.J.Bergius var. *crispa*	**M:** P3, L1, S9, W1, B1, S7, R6, V5, S3, V9, V7, V8, N2	M
67	Apocynaceae	*Carissa bispinosa* (L.) Desf. ex Brenan	**M:** M1; **E:** S7, A6, R6, V5, W4, N2	E
68	Apocynaceae	*Cynanchum africanum* (L.) Hoffmanns.	**M:** W3; **E:** S10; **O:** W3	E
69	Apocynaceae	*Cynanchum viminale* (L.) Bassi [= *Sarcostemma viminale* (L.) R.Br.]	**M:** A6, V5, W1; **E:** A6	**O** (firewood, hygiene)
70	Apocynaceae	*Fockea comaru* (E.Mey.) N.E.Br.	**E:** A4, A5, A6, V4, V5, C3, S5, A6, M5, R6, V5	**M**, E
71	Apocynaceae	*Gomphocarpus cancellatus* (Burm.f.) Bruyns	**M:** A5, A6, C5, L2, A2, M3, N2; **O:** M4, N2	M, O (firewood, social)
72	Apocynaceae	*Gomphocarpus fruticosus* (L.) W.T.Aiton	**M:** P4, S9, W2, W1, G2, G1, P1, K1, R5, H1, N2; **O:** A5, N2	M, O (firewood, construction)
73	Apocynaceae	*Hoodia alstonii* (N.E.Br.) Plowes	**E:** A6	**M**, E
74	Apocynaceae	*Hoodia gordonii* (Masson) Sweet ex Decne.	**M:** K2, L1, R6, V5, A2, O1, M3, V8, A3, N2; **E:** L2, N2, W3	M, E
75	Apocynaceae	*Huernia namaquensis* Pillans	**E:** A6	
76	Apocynaceae	*Larryleachia cactiformis* (Hook.) Plowes	**O:** W3	
77	Apocynaceae	*Microloma calycinum* E.Mey.	**O:** A6, M2	**E**, O (fodder)
78	Apocynaceae	*Microloma sagittatum* (L.) R.Br.	**M:** W3; **E:** A4, A6, A2, S10, W3	M, E, **O** (fodder)
79	Apocynaceae	*Orbea namaquensis* (N.E.Br.) L.C.Leach	**M:** O2; **E:** A6, O2	M, E
80	Apocynaceae	*Pachypodium namaquanum* (Wyley ex Harv.) Welw.	**E:** S2	**O** (environmental)
81	Apocynaceae	*Quaqua incarnata* (L.f.) Bruyns	**E:** S5	**M**, E
82	Apocynaceae	*Quaqua mammillaris* (L.) Bruyns	**M:** V5, N2; **E:** A4, M5, A6, A2, V5, W3	M, E
83	Apocynaceae	*Sarcostemma viminale* (L.) R.Br.	**M:** A6, V5, W1; **E:** A6	**O** (firewood, hygiene)
84	Apocynaceae	*Stapelia similis* N.E.Br.	**E:** N2	E
85	Araceae	*Zantedescia aethiopica* (L.) Spreng.	**M:** P3, K2, W1, C4, B1, B2, R6, A1, A7, V5, V8; **E:** R6, N2	M, **O** (fodder, household)
86	Arecaceae	**Phoenix dactylifera* L.	**E:** F1	E
87	Asparagaceae	*Asparagus aethiopicus* L.	**M:** W3; **O:** W3	M, O (fodder)
88	Asparagaceae	*Asparagus rubicundus* P.J.Bergius	**M:** A1, W3; **O:** W3	M, O (fodder)
89	Asphodelaceae	*****Aloe comosa*** Marloth & A.Berger		**M**, **E**
90	Asphodelaceae	***Aloe ferox* Mill.	**M:** P3, S6, P4, G2, W1, B1, S7, R1, G2, C2, C1, R4, P1, J1, E2, R5, P5, D4, R6, H1, N1, A1, V5, V9, V7, V8, D1, N2, A3; **E:** A3	M
91	Asphodelaceae	***Aloe framesii*** L.Bolus		**M**
92	Asphodelaceae	***Aloe gariepensis*** Pillans		**M**
93	Asphodelaceae	*Aloe khamiesensis* Pillans	**M:** L1, D1, N2; **E:** D1	M
94	Asphodelaceae	*Aloe pearsonii* Schönland	**M:** A6; **O:** L2	M
95	Asphodelaceae	*Aloidendron dichotomum* (Masson) Klopper & Gideon F.Sm. (= *Aloe dichotoma* Masson)	**M:** V2; V1; A6; D1; N2; **E:** A6, N2; **O:** V4, S5, M4, S7, A5, A6, M3, N2, W3	M, E, O (firewood, construction, household)
96	Asphodelaceae	*Bulbine frutescens* (L.) Willd.	**M:** S6, P4, W1, R5, R5, D4, P2, H1, A1, V5, V9, V8, M3, N2	M, **O** (fodder)
97	Asphodelaceae	*Bulbine margarethae* L.I.Hall	**M:** A2	
98	Asphodelaceae	*Bulbine praemorsa* (Jacq.) Roem. & Schult.	**M:** A6, N2; **E:** A6	M, **O** (fodder)
99	Asphodelaceae	*Gasteria pillansii* Kensit	**E:** A6	
100	Asphodelaceae	*Gonialoe variegata* (L.) Boatwr. & J.C.Manning (= *Aloe variegata* L.)	**M:** D3, W1, S7, R1, B2, S4, V9, V7, D1, N2, W3	M
101	Asphodelaceae	*Trachyandra falcata* (L.f.) Kunth	**E:** A4, A6, R6, L2, V5, M3, N2, S10	E
102	Asteraceae	*Arctotheca calendula* (L.) Levyns	**E:** A4, N2	E, **O** (fodder)
103	Asteraceae	*Arctotis revoluta* Jacq.	**M:** N2	**E**, **O** (fodder)
104	Asteraceae	**Artemisia absinthium* L.	**M:** D2, M4, G2, R4, A1, V5, V9, V7, N2	M
105	Asteraceae	***Artemisia afra* Jacq. ex Willd.	**M:** P3, S6, D2, P4, K2, G2, W1, S7, S7, G2, R2, R3, P1, R4, J1, J1, E2, D4, R6, S4, P2, H1, A1, V5, V10, V9, V7, V8, D1, N2	M
106	Asteraceae	**Artemisia vulgaris* L.	**M:** Q1; V11, C1, P1, N2; **O:** P1	M
107	Asteraceae	*Berkheya fruticosa* (L.) Ehrh.	**O:** L2	**E**
108	Asteraceae	***Berkheya spinosissima*** (Thunb.) Willd.		**E**
109	Asteraceae	*Bolandia pinnatifida* (Thunb.) J.C.Manning & Cron. (= *Senecio scapiflorus* auct.)	**M:** N2	
110	Asteraceae	*Chrysocoma ciliata* L.	**M:** M4, S9, W1, S7; K1, R6a, S4, B1, V10, A2, D1, N2, W3, A3; **O:** W3	E, O (fodder, hygiene)
111	Asteraceae	***Cotula barbata*** DC.		**O** (social)
112	Asteraceae	*Crassothonna sedifolia* (DC.) B.Nord.	**O:** L2	
113	Asteraceae	*Dicoma capensis* Less.	**M:** W1, S4, V5, V10, L2, V9, V7, V8, A6, D1; **E:** A6, N2	M, E
114	Asteraceae	*Didelta carnosa* var. *carnosa* (L.f.) Aiton	**O:** A5, L2	O (fodder)
115	Asteraceae	*Didelta spinosa* (L.f.) Aiton	**O:** L2, M3	O (fodder, firewood)
116	Asteraceae	*Dittrichia graveolens* (L.) Greuter	**M:** W1, N2	M
117	Asteraceae	*Elytropappus rhinocerotis* (L.f.) Less.	**M:** P3, M4, D2, K2, W1, S7, P1, R5, R6, S4, P2, A1, V5, L2, V9, V7, V8, N2, W3, W4; **O:** N2., W3	M, O (fodder, firewood)

(*continued on next page*)

Table 1 (*continued*)

	Family	Species (45 species with newly recorded uses in Namaqualand in **bold**)	Literature references of all recorded uses in Namaqualand (in chronological order)[a]	Survey data[b] (147 newly recorded uses[c] in **bold**
118	Asteraceae	*Eriocephalus africanus* L.	**M:** L1, S2, P3, K2, W4, R6, A1, V5, V8; **O:** V5	M, O (fodder, hygiene, social)
119	Asteraceae	*Eriocephalus brevifolius* (DC.) M.A.N.Müll.	**M:** V8, W3; **O:** V8, N2	M, O (firewood, hygiene)
120	Asteraceae	***Eriocephalus microphyllus*** DC.		**O** (fodder)
121	Asteraceae	*Eriocephalus punctulatus* DC.	**M:** P4, W1, G2, S4, N2	**O** (fodder)
122	Asteraceae	***Eriocephalus racemosus*** L.		**O** (fodder)
123	Asteraceae	*Euryops lateriflorus* (L.f.) DC.	**M:** N2	**O** (fodder, firewood, household, social)
124	Asteraceae	*Euryops multifidus* (Thunb.) DC.	**M:** P3, W3	**O** (household)
125	Asteraceae	*Euryops tenuissimus* (L.) DC.	**M:** A1	M, **O** (fodder, social)
126	Asteraceae	*Gazania krebsiana* Less.	**E:** A4	**O** (social)
127	Asteraceae	*Gazania lichtensteinii* Less.	**E:** N2	
128	Asteraceae	*Gorteria diffusa* subsp. *calendulaceae* Thunb.	**M:** A6	
129	Asteraceae	*Helichrysum hamulosum* E.Mey. ex DC.	**M:** A1	
130	Asteraceae	***Helichrysum leontonyx*** DC.		**M**, **E**, **O** (fodder)
131	Asteraceae	***Helichrysum odoratissimum* (L.) Sweet	**M:** D2, K2, W1, S7, G2, R2, J1, V5, S3, V9, V8, N2	M, **O** (firewood, household, environmental)
132	Asteraceae	*Helichrysum rutilans* (L.) D.Don	**M:** N2	
133	Asteraceae	*Hirpicium alienatum* (Thunb.) Druce	**O:** L2, S1	
134	Asteraceae	*Nidorella ivifolia* (L.) J.C.Manning & Goldblatt (= *Conyza scabrida* DC.)	**M:** S6, M4, G2, W1, R6, H1, A1, V10, V7, V9, V8, D1, N2	
135	Asteraceae	*Oncosiphon suffruticosus* (L.) Källersjö	**M:** P3, D2, M4, K2, L1, W1, S7, P1, R6, A1, V5, V10, V9, V8, D1, N2, W3; **O:** N2	M, O (fodder, hygiene)
136	Asteraceae	*Osteospermum grandiflorum* DC.	**O:** L2	
137	Asteraceae	*Osteospermum oppositifolium* (Aiton) Norl. [= *Tripteris oppositifolia* (Aiton) B.Nord.]	**O:** L3	O (fodder)
138	Asteraceae	*Osteospermum sinuatum* (DC.) Norl. (= *Tripteris sinuata* DC.)	**O:** L3	
139	Asteraceae	*Othonna arbuscula* (Thunb.) Sch.Bip	**M:** S7; R6; **O:** A6	
140	Asteraceae	*Othonna daucifolia* J.C.Manning & Goldblatt	**M:** L1, N2	**O** (household, social)
141	Asteraceae	*Othonna leptodactyla* Harv.	**M:** S3	
142	Asteraceae	*Othonna* sp. B	**M:** N2	
143	Asteraceae	*Pentzia incana* (Thunb.) Kunze	**M:** A1, W3; **O:** M4, L2	M, O (fodder, firewood, construction)
144	Asteraceae	*Pteronia aspera* Thunb.	**M:** V5, N2	M
145	Asteraceae	*Pteronia cinerea* L.f.	**M:** N2	
146	Asteraceae	*Pteronia divaricata* (P.J.Bergius) Less.	**O:** N2	**M**, O (household)
147	Asteraceae	*Pteronia incana* (Burm.) DC.	**M:** A1; **O:** L2, W3	M, O (fodder, firewood)
148	Asteraceae	***Pteronia leptospermoides*** DC.		**O** (firewood, household)
149	Asteraceae	*Pteronia lucilioides* DC.	**M:** A6	
150	Asteraceae	*Pteronia onobromoides* DC.	**M:** V5	**O** (fodder)
151	Asteraceae	*Senecio cinerascens* Aiton	**M:** V11, A3, N2, W3	M
152	Asteraceae	*Stoebe plumosa* (L.) Thunb.	**M:** W1, N2, W3	M, **O** (fodder, firewood)
153	Boraginaceae	*Amsinckia menziesii* (Lehm.) A.Nelson & J.F. Macbr. (= *A. retrorsa* Suksd.)	**M:** N2	
154	Boraginaceae	*Codon royenii* L.	**E:** A6, L2, M2, N2	M, E, O (fodder)
155	Boraginaceae	*Lobostemon fruticosus* (L.) H.Buek	**M:** M4, R6, V5, V8, W4	M
156	Boraginaceae	*Lobostemon paniculatus* (Thunb.) H.Buek	**M:** N2	M
157	Boraginaceae	*Trichodesma africanum* (L.) Lehm.	**M:** W3	
158	Brassicaceae	***Heliophila coronopifolia*** L.		**E**, **O** (fodder)
159	Brassicaceae	***Heliophila lactea*** Schltr.		**E**, **O** (fodder)
160	Burseraceae	*Commiphora capensis* (Sond.) Eng.	**M:** A6; **O:** M2	
161	Capparaceae	*Boscia albitruca* (Burch.) Gilg & Gilg-Ben.	**M:** A6, R6, V5; **E:** A6, R6, V5; **O:** A6	E, O (firewood)
162	Capparaceae	*Boscia foetida* Schinz	**M:** L1, V5	
163	Capparaceae	*Cadaba aphylla* (Thunb.) Wild.	**M:** A3, M2, V5; **O:** M2	M, O (fodder, firewood)
164	Caryophyllaceae	*Dianthus micropetalus* Ser.	**M:** W1, P1, S4, V7, N2	
165	Caryophyllaceae	***Dianthus namaensis*** Schinz		**E**
166	Caryophyllaceae	*Silene burchellii* Otth	**M:** S6, P4; G2, W1, B1, G2, H1, V10, N2	
167	Celastraceae	*Gymnosporia linearis* (L.f.) Loes	**O:** A6, M2	
168	Colchicaceae	*Ornithoglossum vulgare* B.Nord.	**E:** W3	
169	Convolvulaceae	*Convolvulus capensis* Burm.f.	**M:** A3	
170	Crassulaceae	*Cotyledon orbiculata* L.	**M:** P3, S6, M4, P4, G2, W1, S7, C4, G2, L5, R3, P1, P1, R4, B2, K1, E2, R5, A6, D4, R6, S4, P2, H1, A1, C5, V5, V5, V10, L2, M3, V8, N2, W3; **O:** M4, A6, L2, M3, N2	M, **E**, O (social)
171	Crassulaceae	*Crassula atropurpurea* (Haw.) D.Dietr.	**M:** W3; **E:** A6, C3	**O** (social)
172	Crassulaceae	*Crassula columnaris* Thunb.	**E:** A6	E
173	Crassulaceae	*Crassula elegans* Schönland & Baker f.	**M:** A6; **E:** A6	
174	Crassulaceae	*Crassula muscosa* L.	**M:** L1, G2, W1, S7, M5, A6, A1, C5, V10, N2, W3, A3	M, **E**, **O** (fodder)
175	Crassulaceae	*Tylecodon paniculatus* (L.f.) Tölken	**M:** A3; **O:** A6, N2	O (social)
176	Crassulaceae	*Tylecodon wallichii* (Harv.) Tölken	**M:** M4; L1; S2; W1; S7; K1; C5; A6; L2; M3; N2; **O:** S7, A6	M
177	Cucurbitaceae	*Acanthosicyos horridus* Welw. ex Hook.f.	**M:** S7, V1, R6; **E:** M4, S2, S7, V5, V1, S8; **O:** L4, V5, M2	
178	Cucurbitaceae	*Citrullus ecirrhosus* Cogn.	**E:** S8; **O:** M2	O (fodder)
179	Cucurbitaceae	*Citrullus lanatus* (Thunb.) Matsumura & Nakai	**M:** R6; **E:** S2, V5; **O:** S2, M2	M, E, O (fodder, social)

Table 1 (*continued*)

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180	Cucurbitaceae	*Cucumis myriocarpus* Naudin	**M:** W1; **E:** A6	
181	Cucurbitaceae	*Kedrostis capensis* (Sond.) A.Meeuse	**M:** P4, W1	M, **E**
182	Cyperaceae	**Cyperus esculentus* L. var. *esculentus*	**E:** A6, R6, V5; **O:** A6	
183	Cyperaceae	*Cyperus longus* L.	**M:** A6; **E:** A6	
184	Cyperaceae	*Cyperus marginatus* Thunb.	**M:** A6; **O:** V2, A6	
185	Cyperaceae	*Ficinia nodosa* (Rottb.) Goetgh., Muasya & D.A. Simpson	**O:** A6	
186	Cyperaceae	*Pseudoschoenus inanis* (Thunb.) Oteng-Yeb.	**O:** A6	
187	Cyperaceae	*Scirpoides dioecus* (Kunth) Browning	**M:** L1; **O:** A5, S2	
188	Dioscoreaceae	*Dioscorea elephantipes* (L'Hér.) Engl.	**M:** R6, L2, N2; **E:** M5, R6, L2, V5, N2	M
189	Ebenaceae	*Diospyros austro-africana* De Winter	**M:** M4, L1, S2, G2, W1, S7, V7, N2, W3; **E:** M4, N2; **O:** N2, W3	M, E, O (fodder, firewood)
190	Ebenaceae	*Diospyros lycioides* Desf.	**M:** L1, A6, R6, A3; **E:** V5; **O:** S5, A6, V5	
191	Ebenaceae	*Diospyros ramulosa* (E.Mey. ex A.DC) De Winter	**M:** A3; **E:** V4, A4, M5, A6, A3, L2, V5, N2, S10; **O:** A6	E
192	Ebenaceae	***Euclea lancea*** Thunb.		**E, O** (firewood)
193	Ebenaceae	*Euclea pseudebenus* E.Mey. ex A.DC.	**M:** A6; **E:** A6; **O:** A6, V5, M2, N2	O (fodder, firewood, household)
194	Ebenaceae	*Euclea tomentosa* E.Mey. ex A.DC.	**E:** N2; **O:** N2	**M**, E, O (firewood)
195	Ebenaceae	*Euclea undulata* Thunb.	**M:** K2, A1, R6, V5, V8; **E:** R6; **O:** W4	M, E, O (firewood)
196	Euphorbiaceae	*Euphorbia hamata* (Haw.) Sweet	**E:** N2; **O:** S7, A6, L2	**M**
197	Euphorbiaceae	*Euphorbia dregeana* E.Mey. ex Boiss.	**O:** A6	**M**, O (fodder, environmental)
198	Euphorbiaceae	*Euphorbia hamata* (Haw.) Sweet	**E:** N2; **O:** S7, A6, L2	**M**
199	Euphorbiaceae	*Euphorbia mauritanica* L.	**M:** V7, N2; **O:** A6, A3, S1	M, O (fodder, firewood, construction, household, social)
200	Euphorbiaceae	*Euphorbia restituta* N.E.Br.	**M:** L1, S2	**E**
201	Euphorbiaceae	*Euphorbia rhombifolia*	**E:** M4, R6, N2, W3; **O:** L2, W3	E, O (fodder)
202	Euphorbiaceae	**Ricinus communis* L.	**M:** P3, S6, D2, G2, M5, A5, V1, A6, R6, A1, V5, V10, L2, V9, V8, D1; **O:** N2	M, O (social)
203	Fabaceae	***Aspalathus linearis* (Burm.f.) R.Dahlgren	**M:** W1, R3, P1, E2, D4, R6, V5, V9, V8, N2; **E:** W1, E2, V5, V9, V8; **O:** P1	M, E, O (social)
204	Fabaceae	***Calobota cytisoides*** (Bergius) Eckl. & Zeyh.		**O** (fodder, firewood)
205	Fabaceae	*Calobota halenbergensis* (Merxm. & A.Schreib.) Boatwr. & B.-E.van Wyk	**O:** L1, L2	**M**, O (fodder, firewood, household, social)
206	Fabaceae	*Calobota sericea* (Thunb.) Boatwr. & B.-E.van Wyk	**O:** A5, L2, W3	**M**, O (fodder, firewood, household, social)
207	Fabaceae	*Lessertia diffusa* R.Br.	**O:** L2	**M**, O (fodder, social)
208	Fabaceae	*Lessertia frutescens* (L.) Goldblatt & J.C.Manning subsp. *microphylla* (Burch. ex DC.) Goldblatt & J.C. Manning	**M:** A5, R6, L2, A1, V5, W1, N2	M
209	Fabaceae	*Lessertia frutescens* (L.) Goldblatt & J.C.Manning subsp. *frutescens*	**M:** P3, S6, M4, P4, K2, L1, S2, G2, S7, B1, G2, E1, R2, P1, E2; A5, V12, A6, D4, R6, S4, A1, C5, V5, V5, V10, L2, A2, M3, V1, V7, V8, D1, N2, W3, A3, W4; **O:** M4, A6, M2	M
210	Fabaceae	*Lessertia spinescens* E.Mey.	**O:** L2	
211	Fabaceae	*Parkinsonia africana* Sond.	**E:** A6, R6b; **O:** A6	
212	Fabaceae	***Prosopis glandulosa*** Torr.		**M**, **E**, **O** (fodder, firewood)
213	Fabaceae	*Schotia afra* (L.) Thunb.	**E:** F1, A6, V5; **O:** A6	
214	Fabaceae	*Vachellia erioloba* (E.Mey.) P.J.H.Hurter	**M:** V1, A6, V6, V5; **E:** P3, M4, A5, A6, M4, R6, V5, V6; **O:** P7, V6, V5	M, O (fodder, firewood)
215	Fabaceae	*Vachellia karroo* (Hayne) Banfi & Galasso	**M:** L1, A6, R6, V5, M3, V8; **E:** P3, M4, L1, S2, A4, A5, A6, R6, L2, V5, V8, N2, S10; **O:** S2, A4, A5, A6, L2, V5, N2	M, E, O (fodder, firewood, construction, household)
216	Gentianaceae	*Chironia baccifera* L.	**M:** L1, P3, G2, W1, B1, S7, E1, P1, E2, R5, D4, R6a, H1, A1, V5, V9, V8, N2, W4	M
217	Geraniaceae	***Erodium cicutarium*** (L.) L'Hér.		**O** (social)
218	Geraniaceae	*Erodium moschatum* (L.) L'Hér.	**O:** N2	O (social)
219	Geraniaceae	*Monsonia crassicaulis* (S.E.A.Rehm) F.Albers	**M:** L1, A6, R6a; **O:** M4, S2, A5, V5, N2	M, O (fodder, firewood)
220	Geraniaceae	***Monsonia flavescens*** (S.E.A.Rehm) F.Albers		**M**
221	Geraniaceae	*Monsonia patersonii* DC.	**M:** L1, A6; **O:** L4, A6, V5	M
222	Geraniaceae	*Monsonia salmoniflora* (Moffett) F.Albers	**O:** M2, W3	
223	Geraniaceae	*Pelargonium antidysentericum* (Eckl. & Zeyh.) Kostel.	**M:** P3; K2; L1; G2; W1; S7; R5; A6; R6a; V5; V9; D1; N2; **E:** A6, R6b, V8	M, E
224	Geraniaceae	*Pelargonium carnosum* (L.) L'Hér.	**E:** A4, A6, V5, N2	E, **O** (fodder, household)
225	Geraniaceae	*Pelargonium crithmifolium* Sm.	**O:** L2, L3	**E**
226	Geraniaceae	*Pelargonium echinatum* Curtis	**O:** L2, L3	**M**, O (fodder, household)
227	Geraniaceae	*Pelargonium fulgidum* (L.) L'Hér.	**E:** V5; **O:** L2, L3	
228	Geraniaceae	*Pelargonium gibbosum* (L.) L'Hér.	**E:** A6, V5	
229	Geraniaceae	*Pelargonium grossularioides* (L.) L'Hér.	**M:** P3, M4, K2, L1, S2, V8, R6 A1	
230	Geraniaceae	*Pelargonium hypoleucum* Turcz.	**M:** N2	
231	Geraniaceae	*Pelargonium incrassatum* (Andrews) Sims	**E:** A4, A6, R6b, L2, V5, M3, S10, N2	**M**, E
232	Geraniaceae	***Pelargonium oblongatum*** Harv.		**E**
233	Geraniaceae	*Pelargonium praemorsum* (Andrews) F.Dietr.	**O:** L2	
234	Geraniaceae	*Pelargonium pulchellum* Sims	**E:** A4, V5; **O:** L2	

(*continued on next page*)

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235	Geraniaceae	*Pelargonium rapaceum* (L.) L'Hér.	**M:** S7, A4, R6a, L3; **E:** M4, S7, A4, A6, R6, V5, C3, N2, L3	E
236	Geraniaceae	*Pelargonium scabrum* (Burm.f.) L'Hér.	**M:** A1; **O:** L2, L3	
237	Geraniaceae	*Pelargonium sericifolium* J.J.A. van der Walt	**O:** L2	
238	Geraniaceae	*Pelargonium tenuicaule* R.Knuth	**E:** A6	
239	Geraniaceae	*Pelargonium triste* (L.) L'Hér.	**M:** P3, A4, R6, S3; **E:** A4; **O:** A4, A5, A6, L2, V5, N2	O (fodder, household)
240	Gunneraceae	*Gunnera perpensa* L.	**M:** P3, S6, P4, G2, W1, G2, B1, J1, R6, H1, A1, V5, V8	
241	Haemodoraceae	*Wachendorfia paniculata* Burm.	**O:** L2	**M**
242	Hyacinthaceae	*Albuca canadensis* (L.) F.M.Leight.	**E:** M4, S7, A4, A6, L2, A2; **O:** N2	E, O (fodder, hygiene)
243	Hyacinthaceae	*Albuca grandis* J.C.Manning & Goldblatt	**E:** S10	E, **O** (fodder)
244	Hyacinthaceae	*Drimia elata* Jacq.	**M:** P3, L2, V5, V8	
245	Hyacinthaceae	*Massonia bifolia* (Jacq.) J.C.Manning & Goldblatt	**E:** A6	E, **O** (fodder)
246	Hyacinthaceae	*Massonia depressa* Houtt.	**E:** A4, L2	E, **O** (fodder, social)
247	Hyacinthaceae	*Veltheimia capensis* (L.) DC.	**M:** V4, S3	
248	Hydnoraceae	*Hydnora africana* Thunb.	**M:** W1, R6a, H1, V5, D1, N2; **E:** S5, M4, S7, A6, S10, N2	M, E
249	Hypoxidaceae	***Empodium namaquensis*** (Baker) M.F. Thomps.		**E**, **O** (fodder)
250	Iridaceae	*Babiana ambigua* (Roem & Schult) G.J.Lewis	**E:** A4	
251	Iridaceae	*Babiana curviscapa* G.J.Lewis	**E:** L2, N2, V5	E
252	Iridaceae	*Babiana dregei* Baker	**E:** A4, A5, A6, L2, V5, N2	E
253	Iridaceae	***Babiana hirsuta*** (Lam.) Goldblatt & J.C. Manning		**M**, **E**
254	Iridaceae	*Babiana hypogaea* Burch.	**E:** A4, R6b, V5	
255	Iridaceae	*Babiana namaquensis* Baker	**E:** A4	
256	Iridaceae	*Ferraria divaricata* Sweet	**E:** V5, R6	E
257	Iridaceae	***Ferraria ferrariola*** (Jacq.) Willd.		**E**
258	Iridaceae	*Ferraria foliosa* G.J.Lewis	**E:** S10	
259	Iridaceae	*Gladiolus saccatus* (Klatt) Goldblatt & M.P.de Vos	**E:** S10	E
260	Iridaceae	*Lapeirousia anceps* (L.f) Ker Gawl.	**E:** V4	
261	Iridaceae	***Lapeirousia silenoides*** (Jacq.) Ker Gawl.		**E**
262	Iridaceae	*Moraea fugax* (D.Delaroche) Jacq.	**E:** A4, A5, A6, S10, M5, R6, V5	E
263	Iridaceae	*Moraea longifolia* (Jacq.) Pers.	**E:** A4, R6, N2, V5	
264	Iridaceae	*Moraea serpentina* Baker	**E:** A6	
265	Iridaceae	*Moraea tortilis* Goldblatt	**E:** N2	
266	Iridaceae	*Watsonia meriana* (L.) Mill.	**E:** A4	
267	Juncaceae	***Juncus acutus*** L.		**O** (construction)
268	Juncaceae	*Juncus rigidus* Desf.	**O:** A6	
269	Lamiaceae	*Ballota africana* (L.) Benth.	**M:** P3, D2, M4, K2, L1, G2, W1, S7, E1, M5, P1, P1, E2, A5, R5, A6, D4, S4, R6, A1, V5, V9, V7, V8, D1, N2, W3, A3, W4; **O:** W3	M
270	Lamiaceae	***Leonotis leonurus* (L.) R.Br.**	**M:** P3, S6, D2, M4, K2, L1, G2, B1, S7, P1, E2, D4, R5, R6, P2, A1, V5, S3, V9, V8, W4, N2, W3; **O:** N2	M, O (social)
271	Lamiaceae	*Mentha longifolia* (L.) Huds.	**M:** P3, P4, L1, W1, B1, S7, G2, R2, P1, E2, A5, A6, D4, S4, R6, P2, H1, A1, V5, V9, V8, D1, N2, W3; **E:** N2; **O:** N2	M, E
272	Lamiaceae	*Salvia africana* L. (= *S. africana-caerulea* L., nom. Illeg.)	**M:** P3, L1, S7, W4, R6, V5	
273	Lamiaceae	*Salvia aurea* L. (= *S. africana-lutea* L., nom. Illeg.)	**M:** L1, S7, A3, S3, V8; **E:** C3	M
274	Lamiaceae	*Salvia chamelaeagnea* P.J.Bergius (= *S. paniculata* L.)	**M:** A1, V8	M
275	Lamiaceae	*Salvia dentata* Aiton	**M:** L1, A5, A6, S1, N2, W3; **O:** N2, W3	M
276	Lamiaceae	*Salvia lanceolata* Lam.	**M:** A5, A6, V12, N2, S10; **E:** S10	M, E
277	Lamiaceae	*Salvia verbenaca* L.	**M:** W2, P1, R5, N2	
278	Lamiaceae	***Stachys flavescens*** Benth.		**M**
279	Lamiaceae	*Stachys rugosa* Aiton	**M:** L1, G2, W1, S7, P1, R6, V10, N2, W3	M, **E**, **O** (fodder)
280	Lauraceae	*Cassytha ciliolata* Nees	**M:** L1, S2, G2, W1, B1, N2	M, **O** (hygiene, social)
281	Limeaceae	*Limeum africanum* L.	**M:** N2; **O:** L2, M2	M, O (fodder)
282	Lobeliaceae	*Cyphia crenata* (Thunb.) C.Presl	**E:** A6, A2, W3	E
283	Lobeliaceae	***Cyphia digitata*** (Thunb.) Willd.		**E**
284	Lobeliaceae	***Cyphia longiflora*** Schltr.		**E**
285	Lobeliaceae	*Cyphia volubilis* (Burm.f.) Willd.	**E:** A4, A5, N2, V5	E
286	Loranthaceae	*Moquiniella rubra* (A.Spreng) Balle	**E:** A4	
287	Loranthaceae	*Septulina glauca* (Thunb.) Tiegh	**E:** N2; **O:** N2	E
288	Loranthaceae	*Tapinanthus oleifolius* (J.C.Wendl.) Danser	**E:** A6	E, **O** (firewood, social)
289	Lythraceae	**Punica granatum* L.	**M:** P3, V5, V8; **E:** F1	M, E
290	Malvaceae	*Hermannia amoena* Dinter ex Friedr.-Holzh	**M:** W3	
291	Malvaceae	*Hermannia cuneifolia* Jacq.	**M:** A1, R6, W3; **E:** S10; **O:** L2, W3	M, E, O (fodder)
292	Malvaceae	*Hermannia macra* Schltr.	**E:** A6	
293	Malvaceae	*Hermannia stricta* (E.Mey. ex Turcz) Harv.	**M:** A6; **O:** A6, L2	
294	Malvaceae	*Hermannia trifurca* L.	**E:** N2, S10; **O:** L2, S10	
295	Malvaceae	**Malva parviflora* L.	**M:** S6, P4, K2, S9, G2, W2, S7, R3, P1, P1, P1, J1, K1, R6 H1, A1, V10, N2	M, **E**, **O** (fodder, social)
296	Malvaceae	*Radyera urens* (L.f.) Bullock	**M:** L2, N2	M
297	Meliaceae	*Nymania capensis* (Thunb.) Lindb.	**M:** L1, M4, W1, A6, A3, S7; **O:** L2	M, O (fodder, firewood, social)
298	Melianthaceae	*Melianthus comosus* Vahl	**M:** R6a, A1, V5	M

Table 1 (*continued*)

	Family	Species (45 species with newly recorded uses in Namaqualand in **bold**)	Literature references of all recorded uses in Namaqualand (in chronological order)[a]	Survey data[b] (147 newly recorded uses[c] in **bold**
299	Melianthaceae	*Melianthus pectinatus* Harv.	**M:** P3, M4, S7, K2, A5, A6, C5, V5, M3, S3, N2, W3	M, **O** (firewood)
300	Menispermaceae	*Antizoma miersiana* Harv.	**M:** L1, A6, N2, W3; **O:** W3	M, O (firewood, fodder, social)
301	Menispermaceae	*Cissampelos capensis* L.f.	**M:** P3, M4, S7, R6, A1, V5, V8	M, **O** (fodder)
302	Molluginaceae	*Adenogramma glomerata* (L.f.) Druce	**O:** L2, L3	
303	Molluginaceae	*Kewa salsoloides* (Burch.) Christenh.	**M:** A6; **E:** A6, W3; **O:** W3	M, E, O (fodder)
304	Molluginaceae	*Pharnaceum lineare* L.f.	**M:** P3, M4, K2, R6	M
305	Montiniaceae	*Montinia caryophyllacea* Thunb.	**M:** N2; **O:** L2, M3, N2	M, **E**, O (firewood, household, social)
306	Moraceae	*Ficus cordata* Thunb.	**E:** A6, N2; **O:** A6, V5, N2	E, O (firewood, household)
307	Moraceae	*Ficus ilicina* (Sond.) Miq.	**E:** A6, N2	E, O (firewood)
308	Myrtaceae	**Eucalyptus camaldulensis* Dehnh.	**M:** W3	
309	Myrtaceae	**Eucalyptus sideroxylon* A.Cunn.	**M:** N2	M
310	Neuradaceae	*Grielum grandiflorum* (L.) Druce	**E:** A6	E, **O** (fodder)
311	Neuradaceae	*Grielum humifusum* Thunb.	**E:** A4, M5, A6, L2, V5, M3, N2	E, **O** (fodder)
312	Oleaceae	*Olea europaea L. subsp. cuspidata* (Wall. ex G. Don) Cif.	**M:** P3, D2, L1, S2, W1, S7, C2, R2, R3, C1, P1, P5, A6, R6, S4, H1, A1, V6, V10, L2, V9, V8, N2; **E:** A6, L2, N2; **O:** A6, L2, N2, M4	M, E, O (firewood, household)
313	Orobanchaceae	*Hyobanche sanguinea* L.	**E:** A4, L2, N2	**M**, E
314	Oxalidaceae	***Oxalis ambigua*** Jacq.		**E**
315	Oxalidaceae	*Oxalis comosa* E.Mey. ex Sond.	**E:** A6; **O:** L2	
316	Oxalidaceae	*Oxalis copiosa* F.Bolus	**M:** A6; **E:** A4, A6, V5	E
317	Oxalidaceae	*Oxalis flava* L.	**E:** M5	E
318	Oxalidaceae	***Oxalis inconspicua*** T.M.Salter		**E**
319	Oxalidaceae	*Oxalis namaquana* Sond.	**O:** L2	
320	Oxalidaceae	*Oxalis obtusa* Jacq.	**E:** A6	
321	Oxalidaceae	*Oxalis pes-caprae* L.	**M:** P3, S7; **E:** P3, S7, A6, L2, N2, S10, V5; **O:** L2	M, E
322	Oxalidaceae	***Oxalis purpurea*** L.		**E**
323	Parmeliaceae	*Parmelia* spp. (*Xanthoparmelia* spp.)	**M:** M4; V1; A1; V5; A2; V7; V9; D1; N2; A3	M
324	Plumbaginaceae	*Dyerophytum africanum* (Lam.) Kuntze	**O:** L2	
325	Plumbaginaceae	*Limonium dregeanum* (C.Presl) Kuntze	**O:** A6	
326	Poaceae	*Cynodon dactylon* (L.) Pers.	**O:** N2	**M**, O (fodder)
327	Poaceae	***Phragmites australis*** (Cav.) Trin. ex Steud.		**O** (social)
328	Poaceae	***Schismus schismoides*** (Stapf ex Conert) Verboom & H.P.Linder		**O** (firewood)
329	Poaceae	*Stipagrostis brevifolia* (Nees) De Winter	**E:** S7	
330	Poaceae	*Stipagrostis ciliata* (Desf.) De Winter	**O:** L2	
331	Poaceae	*Stipagrostis obtusa* (Delile) Nees	**O:** L2	
332	Polygalaceae	*Muraltia spinosa* (L.) F.Forest & J.C.Manning	**M:** P3, W4, R6a, V5; **E:** V4, M4, M5, L2, V5, N2	M, **O** (fodder)
333	Polygalaceae	***Polygala leptophylla*** Burch.		**M**, **E**, **O** (fodder)
334	Polygonaceae	*Rumex cordatus* Poir.	**M:** N2	
335	Pteridaceae	*Cheilanthes capensis* (Thunb.) Sw.	**E:** A6	
336	Pteridaceae	*Cheilanthes induta* Kunze	**M:** N2	
337	Pteridaceae	***Cheilanthes namaquensis*** (Baker) Schelpe & N.C.Anthony		**M**
338	Restionaceae	*Restio sieberi* Kunth	**O:** A5, A6, V5	O (household)
339	Rhamnaceae	*Ziziphus mucronata* Willd.	**M:** P7, V2, A6, R6, V5; **E:** A6, V5; **O:** S2, A5, A6, L2, C3	E, O (household, construction)
340	Rubiaceae	*Galium capense* Thunb. subsp. *namaquense* (Eckl. & Zeyh.) Puff	**M:** N2	
341	Rubiaceae	*Galium tomentosum* Thunb.	**M:** M5, A5, A6, S4, V7, D1, N2; **O:** N2	M, O (household, social)
342	Ruscaceae	*Eriospermum capense* (L.) Thunb.	**M:** P3, L1, S2, S7, R6	M, **E**
343	Rutaceae	***Agathosma betulina* (P.J. Bergius) Pillans	**M:** S5, P3, D2, L1, S2, M4, K2, G2, W1, S7, R3, E2, R5, R6, V5, V9, V8, D1, W4; **O:** S2	M, **E**
344	Rutaceae	*Diosma acmaeophylla* Eckl. & Zeyer	**M:** N2	
345	Rutaceae	**Ruta graveolens* L.	**M:** D2 K2, G2, W1, S7, R3, C1, P1, R4, R6, A1, V5, V9, V7, V8, D1, N2, W3	M
346	Salicaceae	*Salix mucronata* Thunb.	**M:** D2, B1, C2, R2, E2, A6, V5, V6, V10, V9, V7, V8, N2; **O:** A6	M, O (household)
347	Santalaceae	*Lacomucinaea lineata* (L.f.) Nickrent & M.A. Garcia (= *Thesium lineatum* L.f.)	**O:** W3	**M**, **E**
348	Santalaceae	*Viscum capense* L.f.	**M:** P3, D2, K2, L1, W1, S7, R3, J1, A1, R6, H1, V5, V10, V9, V8, D1, N2, W3 A3; **E:** D1	M, E, **O** (fodder)
349	Santalaceae	*Viscum rotundifolium* L.f.	**M:** A1; **E:** A6	M, E, **O** (fodder)
350	Sapindaceae	*Dodonaea viscosa* Jacq.	**M:** P3, D2, M4, K2, L1, G2, W1, S7, A5, P5, R6, A1, V5, V10, L2, V9, V7, V8, D1, W4, N2, W3; **O:** L2, N2	M, O (firewood, construction, household)
351	Sapindaceae	*Erythrophysa alata* (Eckl. & Zeyh.) Hutch.	**O:** N2	**M**, O (firewood, fodder, social)
352	Sapindaceae	*Pappea capensis* Eckl. & Zeyh.	**M:** P3, R6; **E:** R6, V5, M2; **O:** V5	E
353	Scrophulariaceae	*Aptosimum albomarginatum* Marloth & Engl.	**M:** R6a	**O** (fodder)
354	Scrophulariaceae	*Aptosimum indivisum* Burch. ex Benth.	**M:** S7; **O:** L2	O (fodder)
355	Scrophulariaceae	*Aptosimum spinescens* (Thunb.) F.E.Weber	**M:** S7, R6, W3; **O:** L2	M, O (fodder)
356	Scrophulariaceae	*Colpias mollis* E.Mey. ex Benth.	**M:** W3	
357	Scrophulariaceae	*Manulea cephalotes* Thunb.	**O:** A6	
358	Scrophulariaceae	*Peliostomum leucorrhizum* E.Mey. ex Benth.	**O:** L2	

(*continued on next page*)

Table 1 (*continued*)

	Family	Species (45 species with newly recorded uses in Namaqualand in **bold**)	Literature references of all recorded uses in Namaqualand (in chronological order)[a]	Survey data[b] (147 newly recorded uses[c] in **bold**
359	Scrophulariaceae	*Peliostomum virgatum* E.Mey. ex Benth.	**O:** L2	
360	Scrophulariaceae	*Teedia lucida* (Sol.) Rudolphi	**M:** N2	
361	Solanaceae	**Datura stramonium* L.	**M:** P3, S6, D2, M4, P4, S9, G2, W2, W1, S7, R3, C1, G1, P1, K1, R6, S4, H1, A1, V5, V10, V7, V8, N2; **O:** N2	M, O (hygiene)
362	Solanaceae	*Lycium oxycarpum* Dunal	**E:** A6	
363	Solanaceae	**Nicotiana glauca* Graham	**M:** S9, W2, W1, G1, K1, A5, V2, A6, R6, S4 A1, V5, V10, V7, N2, W3; **O:** A6, N2	M, O (firewood, construction, social)
364	Solanaceae	*Solanum burchellii* Dunal	**M:** L2	M
365	Solanaceae	***Solanum gifbergense*** Dunal		**M**, **O** (fodder)
366	Solanaceae	*Solanum guineense* L.	**M:** N2	
367	Solanaceae	*Solanum nigrum* L.	**M:** P3, R6; **E:** M4, A6, R6b, V5, S8; **O:** V5	E
368	Solanaceae	*Solanum tomentosum* L.	**M:** P4, W1, B1, G2, A6, R6, H1, A1, D1	M, **E**, **O** (fodder)
369	Tamaricaceae	*Tamarix usneoides* E.Mey. ex Bunge	**M:** A6, V2, V1; **O:** S2, A6, N2	M, **E**, O (firewood, construction)
370	Tecophilaeaceae	*Cyanella hyacinthoides* L.	**E:** A4, A6	E
371	Tecophilaeaceae	***Cyanella lutea*** L.f		**M**, **E**
372	Tecophilaeaceae	*Cyanella orchidiformis* Jacq.	**E:** A4, L3	E
373	Urticaceae	*Forsskaolea candida* L.f.	**M:** M2	**E**
374	Urticaceae	**Urtica urens* L.	**M:** D2; K2; W2; W1; C1; P1; S4; H1; A1; V10; V9; V7; N2; **E:** W1, C1, V10, N2; **O:** W1, C1, N2	M, E, O (social)
375	Vitaceae	*Cyphostemma bainesii* (Hook.f.) Desc.	**E:** A6	
376	Zygophyllaceae	*Augea capensis* Thunb.	**O:** M2	**E**, O (fodder)
377	Zygophyllaceae	*Roepera cordifolia* (L.f.) Beier & Thulin	**O:** A6	**M**, O (hygiene)
378	Zygophyllaceae	***Roepera foetida*** (Schrad. & J.C.Wendl.) Beier & Thulin		**M**, **E**, **O** (fodder, hygiene)
379	Zygophyllaceae	*Roepera morgsana* (L.) Beier & Thulin	**M:** M5, R6	**E**, **O** (hygiene)
380	Zygophyllaceae	***Sisyndite spartea*** E.Mey. ex Sond.		**O** (firewood)
381	Zygophyllaceae	*Tetraena microcarpa* (Licht. ex Cham.) Beier & Thulin	**M:** S9, W1, S7, V10, R6a, S4	
382	Zygophyllaceae	*Tetraena prismatocarpa* (E.Mey. ex Sond.) Beier & Thulin	**O:** A6	O (firewood, fodder, household)
383	Zygophyllaceae	*Tribulus terrestris* L.	**E:** A6; **O:** M2	O (fodder)
384	Zygophyllaceae	*Zygophyllum sonderi* H. Eichler	**O:** A6	

[a] Abbreviations for literature references: A1: Anonymous (1998); A2: Anonymous (2006); A3: Anonymous (undated); A4: Archer (1982); A5: Archer (1990); A6: Archer (1994); A7: Arnold et al. (2002); B1: Batten and Bokelman (1966); B2: Batten (1986); C1: Chiej (1984); C2: Coates Palgrave (1977); C3: Coetzee and Miros (2009); C4: Courtenay-Latimer et al. (1967); C5: Cowling and Pierce (1999); D1: De Beer and Van Wyk (2011); D2: Dykman (1908); D3: Dykman (1923); D4: Dyson (1994); E1: Eliovson (1972); E2: Ellis (1989); F1: Fox and Norwood Young (1982); G1: Gelfand et al. (1985); G2: Githens (1948); H1: Hutchings et al. (1996); J1: Johnson and Hutchings (1986); K1: Kellerman et al. (1988); K2: Kling (1923); L1: Laidler (1928); L2: Le Roux and Wahl (2005); L3: Le Roux (2015); L4: Levinson (1961); L5: Lucas and Pike (1971); M1: Mabogo (1990); M2: Mannheimer et al. (2008); M3: Manning (2008); M4: Marloth (1917); M5: Metelerkamp and Sealy (1983); N1: Neuwinger (1996); N2: Nortje (2012) and Nortje and Van Wyk (2015); O1: Odendaal et al. (2007); P1: Palmer (1985); P2: Palmer (1995); P3: Pappe (1868); P4: Phillips (1917); P5: Pooley (1993); P6: Powrie (2004); P7: Coates Palgrave (1983); Q1: Quisumbing (1951); R1: Reynolds (1970); R2: Roberts (1983); R4: Roberts (1985); R5: Roberts (1992); R6a: Rood (1994b); R6b: Rood (1994a); S1: Samuels (2006); S2: Schapera (1930); S3: Scott and Hewett (2008); S4: Shearing and Van Heerden (1994); S5: Skead (2009); S6: Smith (1895); S7: Smith (1966); S8: Snijman (2013); S9: Steyn (1934); S10: Steyn (2012); V1: Van den Eynden and Van Dammen (1993); V2: Van den Eynden et al. (1992); V3: Van der Merwe (1945); V4: Van der Stel (1685); V5: Van Wyk and Gericke (2000, 2018); V6: Van Wyk et al. (2000); V7: Van Wyk et al. (2008); V9: Van Wyk (2008); V10: Von Koenen (2001); V11: Von Reis Altschul (1973); V12: Van Breda and Barnard (1991); W1: Watt and Breyer-Brandwijk (1962); W2: Webb (1948); W3: Wheat (2013); W4: Wileman (undated); W5: Wright (1963).

[b] Participants who contributed to the survey data: Adams, B. (Hondeklipbaai); Adams, R. (Lekkersing); Adams, W. (Lekkersing); Adolph, M. (Vanrhynsdorp); Adolph, S. (Vanrhynsdorp); Afrika, G. (Grootdrif); April, K. (farm Bruinskop); Arendse, F. (Port Nolloth); Arendse, L. (Hondeklipbaai); Basson, J. (Eksteenfontein); Basson, W. (Eksteenfontein); Beukes, P. (Concordia); Bezuidenhoudt, M. (Concordia); Bok, A. (Steinkopf); Bok, C. (Concordia); Bok, R. (Steinkopf); Boois, C. (Spoegrivier); Boois, S. (Lepelfontein); Boyes, A. (Spoegrivier); Burger, I.D (Urionskraal); Burger, M. (Urionskraal); Burgess, G. (Steinkopf); Burgess, J. (Steinkopf); Carstens, F. (Eksteenfontein); Chrisjan, C. (Spoegrivier); Christiaan, K. (Koeboes); Claase, A. S. (Vanrhynsdorp); Cloete, K. (Koeboes); Cloete, A. (Hondeklipbaai); Cloete, A. (Concordia); Cloete, C. (Port Nolloth); Cloete, G. (Grootmist); Cloete, H. (Eksteenfontein); Cloete, G. (Rooiberg); Cloete, J. (Lekkersing); Cloete, J. (Urionskraal); Cloete, J. (Concordia); Cloete, J. (Lekkersing); Cloete, K. (Koeboes); Cloete, L. (Concordia); Cloete, M. (Lekkersing); Cloete, M. (Concordia); Cloete, R. (Urionskraal); Cloete, S. (Hondeklipbaai); Cloete, T. (Concordia); Cloete, W. (Concordia); de Klerk, L. (Concordia); Diergaardt, N. (Rooiberg); Diergaardt, W. (Eksteenfontein); Diergaardt, A. (Rooiberg); Eiman, D. (Vanrhynsdorp); Engelbrecht, J. (Concordia); Engelbrecht, M. (Concordia); Farmer, J. R. (Eksteenfontein); Flink, D. (Rooiberg); Flink, E. (Rooiberg); Fortuin, G. (Hondeklipbaai); Fortuin, G. (Spoegrivier); Fortuin, S. (Eksteenfontein); Fortuin, S. (Spoegrivier); George, S. (Port Nolloth); Hans, W. (Koeboes); Horn, H. (Grootdrif); Jacobs, H. (Concordia); Januarie, B. (Uitkyk, Lutzville); Januarie, J. (Uitkyk, Lutzville); Joseph, E. (Koeboes); Joseph, M. (Eksteenfontein); Joseph, N. (Lekkersing); Joseph, S. (Eksteenfontein); Joseph, W. (Eksteenfontein); Joshua, E. (Koeboes); Klaase, M. (Spoegrivier); Klaase, R. (Lepelfontein); Klaase, S. (Spoegrivier); Koordom, A. (Hondeklipbaai); Koordom, C. (Hondeklipbaai); Koordom, J. (Hondeklipbaai); Koordom, S. (Hondeklipbaai); Koorste, H. (farm Bruinskop); Kyser, J. (Concordia); Lindert, T. (Rooiberg); Links, B. (Spoegrivier); Links, F. (Lekkersing); Links, M. (Koeboes); Linnert, A. (Vanrhynsdorp); Linnert, J. (Vanrhynsdorp); Maarman, S. (Koekenaap); Mannies, E. (Port Nolloth); Meyer, J. (Concordia); Meyer, V. (Concordia); Nero, B. (Lekkersing); Nero, C. (Lekkersing); Nero, D. (Concordia); Nero, J. (Lekkersing); Nero, V. (Lekkersing); Ngoma, N. (Koekenaap); Owies, A. (Koeboes); Owies, C. (Lepelfontein); Owies, E. (Lepelfontein); Owies, J. (Lepelfontein); Owies, J. (Koeboes); Paul, A. (Port Nolloth); Philander, S. (Uitkyk, Lutzville); Rooi, J. (Eksteenfontein); Rooi, L. (Eksteenfontein); Rossouw, H. A. (farm Katdoornvlei); Saaiman, B. (Steinkopf); Saal, D. (Concordia); Saal, K. (Concordia); Sanderson, S. (Port Nolloth); Slaander, P. (Koeboes); Slaander, S. (Koeboes); Steenkamp, S. (Spoegrivier); Stevens, W. (Lepelfontein); Stoffel, K. (Lekkersing); Strauss, F. (Port Nolloth); Stuurman, J. (Rooiberg); Swart, L. (Urionskraal); Swartbooi, C. (Koeboes); Swarts, J. (Rooiberg); Tieties, C. (Elandskraal); Tomas, J. (Grootmis); Van den Heever, J. (Concordia); Van der Westhuizen, J. (Eksteenfontein); Van Gent, D. (Eksteenfontein); Van Rooyen, M. (Concordia); Van Wyk, J. (Urionskraal); Van Zyl, P. (Springbok); Visser, P. (Gemsbokrivier); Willems, A. (Urionskraal).

[c] Craft and other miscellaneous uses are divided into seven main categories: firewood (include tinders and igniters); fodder; construction; household (including digging sticks, ornaments, weapons); social (music, art, toys, jewellery); hygiene (soap, perfume, cosmetic); environmental (compost, insect repellents and poisons).

adhered to the ethical principles as outlined in International Society of Ethnobiology (2006) [ISE Code of Ethics (with 2008 additions)].

The data in the comprehensive checklist (Appendix A) and the list of useful species (Table 1) were used to generate scatter plots and to do regression analysis in order to explore the concept of non-random plant selection of Moerman (1979, 1991). The relationship between the number of plant species used per family and the overall number of species in that family was studied using the linear regression analysis model. The independent variable in the analysis is the total number of species and infraspecific taxa in each family

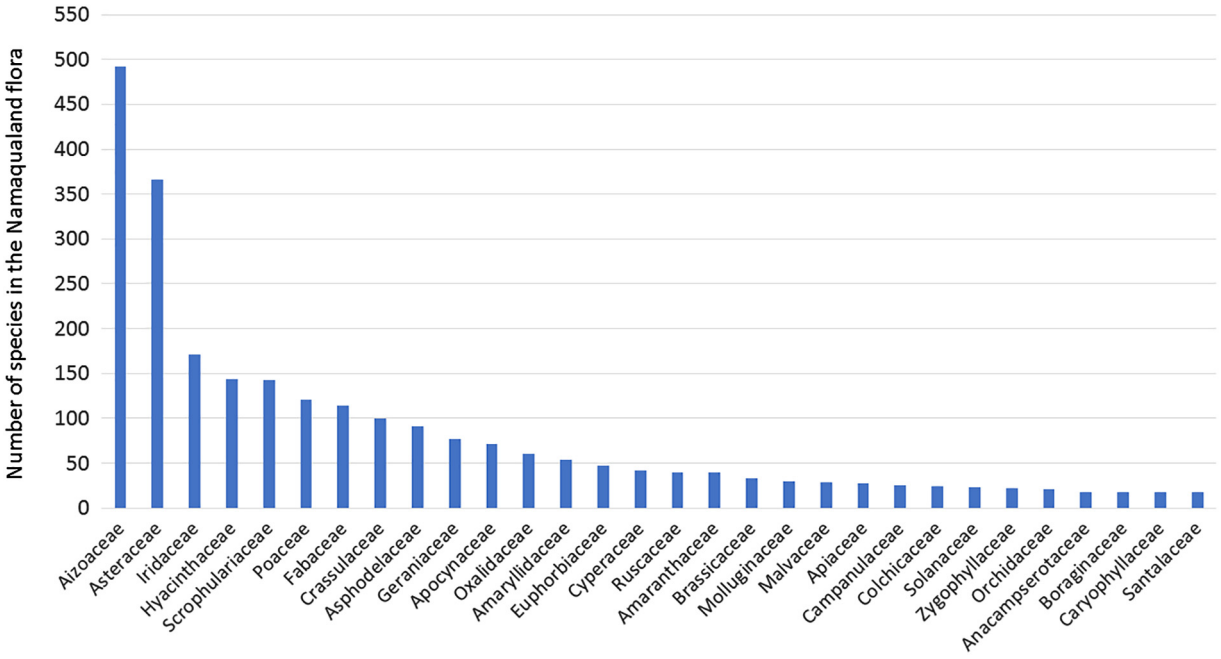

Fig. 1. The most species-rich families in the vascular flora of Namaqualand.

occurring in Namaqualand and the dependent variable is the number of useful species and infraspecific taxa in Namaqualand for the same families. Species and infraspecific taxa are hereafter referred to as 'species' because the numbers differ only slightly, as noted above. Scatter plots, trend lines and regression equations were generated in Microsoft Excel. All 119 families of vascular plants with indigenous or naturalised species in Namaqualand were included in the analyses (i.e., also families with as yet no recorded uses for any of the species). Families with the highest and lowest residual values (i.e., those with the largest differences between predicted and actual species numbers, including all those with residual values exceeding the standard error) are listed. Regression analyses were also done separately for each of the three main use categories, namely medicinal plant species, edible plant species and craft plant species. The results of the regression analyses, including the scatter plots of families, the coefficient of determination (r^2), standard error and *p*-values are shown in the relevant figures.

3. Results and discussion

3.1. Inventory of all useful plant species of Namaqualand

The inventory of all indigenous and naturalised vascular plants in Namaqualand includes a total of 2902 species (or 2916 taxa, if infraspecific taxa are counted) (Appendix A), of which 429 are either used in Namaqualand or are most likely to be used there in the same way as in other parts of the Northern and Western Cape Provinces of South Africa. Of these, 326 species were recorded during interviews as being useful for one or more purpose in Namaqualand. Additonal use-records from the literature increased the number of ethnobotanically relevant species for Namaqualand to 383 species/384 taxa (Table 1), representing 13.2% of the total flora. It is important to note that only species with recorded uses in Namaqualand were included—Namaqualand plant species with uses recorded elsewhere were not taken into account.

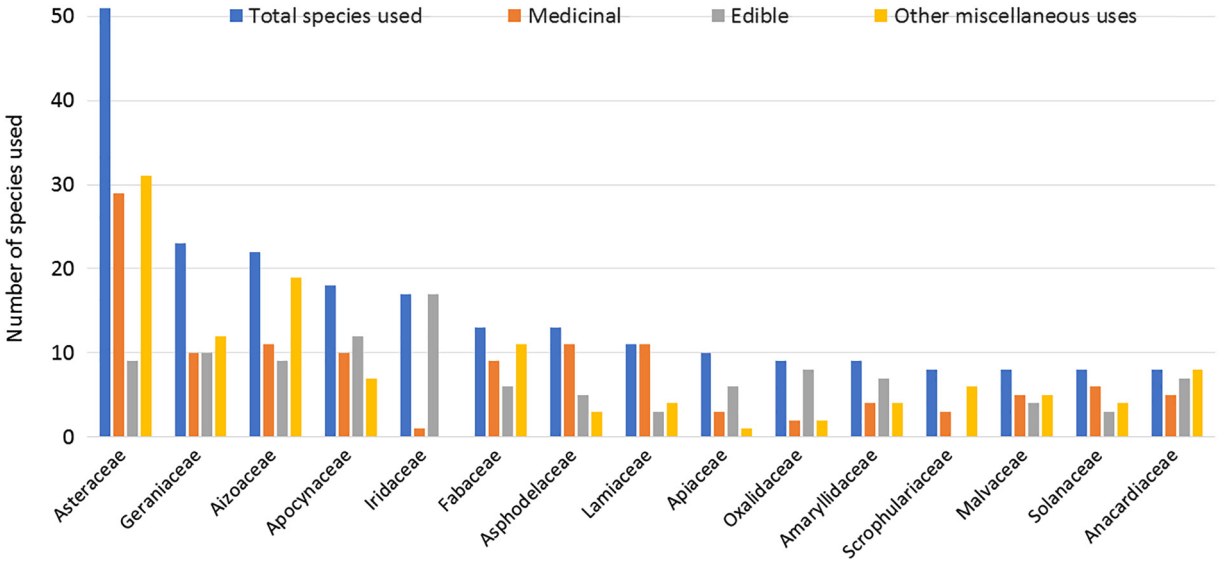

Fig. 2. Namaqualand plant families with the largest numbers of useful species.

Table 2
Useful plant families of Namaqualand with the highest and lowest residual values in a regression analysis. Those exceeding the standard error of 3.85 are shown in bold.

Family	Number of species used	Total number of species	Predicted	Residual
Families with the highest residual values				
Asteraceae	**51**	**366**	**30**	**21**
Geraniaceae	**23**	**77**	**7**	**16**
Apocynaceae	**18**	**71**	**7**	**11**
Lamiaceae	**11**	**17**	**3**	**8**
Apiaceae	**10**	**27**	**3**	**7**
Zygophyllaceae	**9**	**22**	**3**	**6**
Anacardiaceae	**8**	**12**	**2**	**6**
Ebenaceae	**7**	**9**	**2**	**5**
Solanaceae	**8**	**23**	**3**	**5**
Asphodelaceae	**13**	**91**	**8**	**5**
Families with the lowest residual values				
Crassulaceae	7	100	9	−2
Colchicaceae	1	24	3	−2
Acanthaceae	0	12	2	−2
Orchidaceae	0	21	3	−3
Campanulaceae	0	25	3	−3
Ruscaceae	1	40	4	−3
Scrophulariaceae	**8**	**143**	**13**	**−5**
Poaceae	**5**	**121**	**11**	**−6**
Hyacinthaceae	**6**	**144**	**13**	**−7**
Aizoaceae	**22**	**492**	**40**	**−18**

A total of 119 vascular plant families is represented in the flora of Namaqualand. The 10 largest families by number of species (Fig. 1) are Aizoaceae (492 spp.), Asteraceae (366 spp.), Iridaceae (171 spp.), Hyacinthaceae (144 spp.), Scrophulariaceae (143 spp.), Poaceae (121 spp.), Fabaceae (114 spp.), Crassulaceae (100 spp.), Asphodelaceae (91 spp.) and Geraniaceae (75 spp.).

Of the 119 vascular plant families represented in Namaqualand, 77 (65%) include useful species, of which 64 (54%) families are used for medicinal purposes, 53 (43%) families include edible species, and 56 (47%) families include species with other miscellaneous uses (Fig. 2). The total number of plant species in each of these categories are as follows: 240 (63%) medicinal, 186 (49%) edible, and 218 (57%) with other miscellaneous uses. One hundred and one (101) species are used for both medicinal and edible purposes, 132 species for medicinal and other miscellaneous uses, 93 species for edible and other miscellaneous uses, and 55 species for medicinal, edible and other miscellaneous uses. The medicinal plants (240 species) represent 8.0% of the Namaqualand flora, the edible plants (186 species) 6.4% and the plants with other miscellaneous uses (218 species) 7.5%. The 15 families with the largest numbers of useful plant species are Asteraceae (51 spp.), Geraniaceae (23 spp.), Aizoaceae (22 spp.), Apocynaceae (18 spp.), Iridaceae (17 spp.), Asphodelaceae (13 spp.), Fabaceae (13 spp.), Lamiaceae (11 spp.), Apiaceae (10 spp.), Oxalidaceae and Zygophyllanceae (both 9 spp.) and Amaryllidaceae, Anacardiaceae, Scrophulariaceae and Solanaceae (all with 8 spp.) (Fig. 2).

A total of 17 exotic (non-indigenous to South Africa) species have recorded uses in Namaqualand, namely *Acorus calamus, Artemisia absinthium, Artemisia vulgaris, Atriplex lindleyi, Atriplex nummularia, Cyperus esculentus, Datura stramonium, Eucalyptus camaldulensis, Eucalyptus sideroxylon, Nicotiana glauca, Phoenix dactylifera, Prosopis glandulosa, Ricinus communis, Ruta graveolens, Salsola kali, Schinus molle* and *Urtica urens* (Table 1). These include 14 medicinal plant species, 6 edible plant species and 11 craft plant species (with miscellaneous uses). Exotic species with a high number of citations in both the literature and our own survey work include *Acorus calamus, Artemisia absinthium, Artemisia vulgaris, Datura stramonium, Eucalyptus sideroxylon, Nicotiana glauca, Phoenix dactylifera, Ruta graveolens, Schinus molle* and *Urtica urens*.

Eight indigenous South African plant species have become locally important in Namaqualand even though they do not occur naturally in the region. Five of them (*Aloe comosa, Aloe ferox, Artemisia afra, Leonotus leonurus* and *Tulbaghia violacea*) are cultivated in gardens, mainly for local medicinal use. Three others (*Agathosma betulina, Aspalathus linearis* and *Helichrysum odoratissimum*) are bought as commercial products or sourced elsewhere and sold locally. The popularity of *Agathosma betulina* in the Kamiesberg was already noted by Laidler (1928). According to him, this buchu was locally known as *P/nkaou* and was considered rare and valuable. It is noteworthy that *A. betulina* is endemic to the Cederberg, some 275 km south of the Kamiesberg.

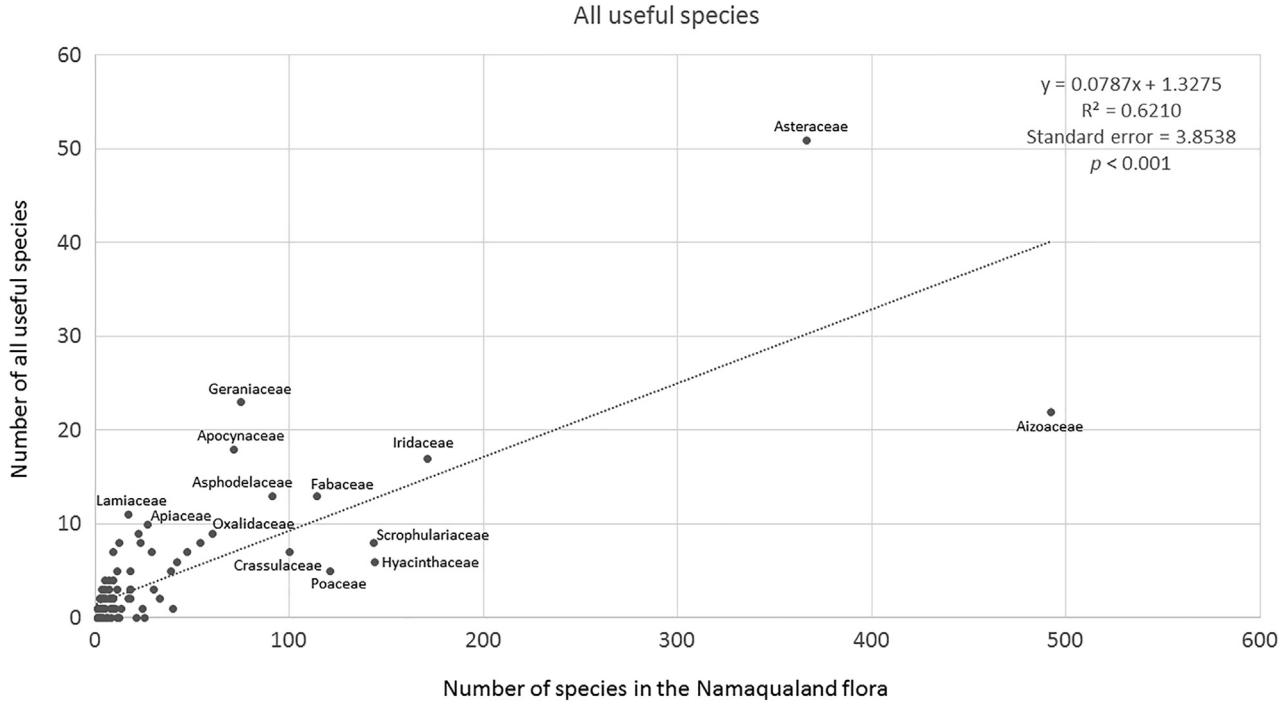

Fig. 3. Scatterplot of the families of vascular plants in Namaqualand, comparing the numbers of available species with the numbers of species that are used in Namaqualand.

Our results include 45 newly recorded ethnobotanical plant species (i.e., species that have not yet been identified as ethnobotanically relevant) and 147 newly recorded uses (shown in bold in Table 1). The new useful species records include two as yet undescribed species in the Apiaceae.

The most important families in terms of the number of species used for medicinal purposes are Asteraceae (35 spp.), Apocynaceae (14 spp.), Aizoaceae (13 spp.); Asphodelaceae, Geraniaceae and Lamiaceae (11 spp. each); Fabaceae (9 spp.); Euphorbiaceae and Solanaceae (7 spp. each); Crassulaceae and Ebenaceae (6 spp. each) and Anacardiaceae, Apiaceae, Boraginaceae, Malvaceae and Scrophulariaceae (5 spp. each).

The families with the highest numbers of edible plants are Iridaceae (17 spp.), Apocynaceae (14 spp.), Geraniaceae (12 spp.); Aizoaceae and Asteraceae (9 spp. each), Oxalidaceae (8 spp.), Anacardiaceae and Ebenaceae (7 spp. each), Amaryllidaceae and Apiaceae (6 spp. each) and the Asphodelaceae, Crassulaceae, Cucurbitaceae and Fabaceae (5 spp. each).

The families with the largest numbers of species used in crafts and miscellaneous other uses are Asteraceae (32 spp.), Aizoaceae (17 spp.), Geraniaceae (14 spp.), Fabaceae (11 spp.), and Anacardiaceae, Apocynaceae and Zygophyllaceae (8 spp. each), Amaranthaceae and Ebenaceae (7 spp. each), Euphorbiaceae and Scrophulariaceae (6 spp. each) and the Amaryllidaceae, Crassulaceae, Cyperaceae, Poaceae and Solanaceae (5 spp. each).

3.2. Regression analyses of the useful plant families of Namaqualand

The concept of non-random plant selection of Moerman (1979) was explored for the useful plant families of Namaqualand, using regression analysis (Table 2; Fig. 3). The aim was to provide scatter plots of the total numbers of species per family in Namaqualand against the number of species in each family that have one or more recorded use in Namaqualand (used as food, medicine or for other miscellaneous purposes in Namaqualand).

The overall result shows an R^2 value of 0.6210 (p-value ≤ 0.001), indicating that 62% of the variance in the numbers of species used per family can be explained by the number of available species in the families. It is noteworthy that the most species-rich family in Namaqualand, the Aizoaceae, had the lowest residual value (−17). Although Aizoaceae included the third largest number of useful species, this number is far below that predicted by the regression equation. The second largest family, Asteraceae, had the highest overall number of useful species and also the highest residual value (+21), followed by Geraniaceae (+16), Apocynaceae (+11), Lamiaceae (+8) and Apiaceae (+7) (Table 2).

Regression analyses were also done separately for medicinal plants, edible plants and craft/miscellaneous plants (Tables 3, 4, 5; Figs. 4, 5 and 6). The R^2 value for medicinal plants is 0.5028, for edible species 0.3373

Table 3
Medicinal plant families of Namaqualand with the highest and lowest residual values in a regression analysis. Those exceeding the standard error of 2.96 are shown in bold.

Family	Number of medicinal species	Total number of species	Predicted	Residual
Families with the highest residual values				
Asteraceae	**35**	**366**	**18**	**17**
Apocynaceae	**14**	**71**	**4**	**10**
Lamiaceae	**11**	**17**	**2**	**9**
Geraniaceae	**11**	**77**	**5**	**6**
Asphodelaceae	**11**	**91**	**5**	**6**
Solanaceae	**7**	**23**	**2**	**5**
Ebenaceae	**6**	**9**	**1**	**5**
Anacardiaceae	**5**	**12**	**1**	**4**
Boraginaceae	**5**	**18**	**2**	**3**
Euphorbiaceae	**6**	**47**	**3**	**3**
Alliaceae	**4**	**5**	**1**	**3**
Apiaceae	**5**	**27**	**2**	**3**
Malvaceae	**5**	**29**	**2**	**3**
Fabaceae	**9**	**114**	**6**	**3**
Cucurbitaceae	**4**	**11**	**1**	**3**
Families with the lowest residual values				
Ruscaceae	1	40	3	−2
Orchidaceae	0	21	2	−2
Colchicaceae	0	24	2	−2
Campanulaceae	0	25	2	−2
Brassicaceae	0	33	2	−2
Scrophulariaceae	**5**	**143**	**8**	**−3**
Hyacinthaceae	**3**	**144**	**8**	**−5**
Poaceae	**1**	**121**	**7**	**−6**
Iridaceae	**1**	**171**	**9**	**−8**
Aizoaceae	**13**	**492**	**24**	**−11**

Table 4
Edible plant families of Namaqualand with the highest and lowest residual values in a regression analysis. Those exceeding the standard error of 2.37 are shown in bold.

Family	Number of edible species	Total number of species	Predicted	Residual
Families with the highest residual values				
Iridaceae	**17**	**171**	**6**	**11**
Apocynaceae	**14**	**71**	**3**	**11**
Geraniaceae	**11**	**77**	**3**	**8**
Ebenaceae	**7**	**9**	**1**	**6**
Anacardiaceae	**7**	**12**	**1**	**6**
Oxalidaceae	**8**	**60**	**3**	**5**
Apiaceae	**6**	**27**	**2**	**4**
Cucurbitaceae	**5**	**11**	**1**	**4**
Amaryllidaceae	**6**	**54**	**2**	**4**
Alliaceae	**4**	**5**	**1**	**3**
Lobeliaceae	**4**	**9**	**1**	**3**
Lamiaceae	**4**	**17**	**1**	**3**
Families with the lowest residual values				
Acanthaceae	0	12	1	−1
Restionaceae	0	13	1	−1
Asparagaceae	0	17	1	−1
Santalaceae	0	18	1	−1
Orchidaceae	0	21	1	−1
Campanulaceae	0	25	2	−2
Asteraceae	9	366	11	−2
Poaceae	**1**	**121**	**4**	**−3**
Scrophulariaceae	**0**	**143**	**5**	**−5**
Aizoaceae	**9**	**492**	**14**	**−5**

Table 5
Vascular plant families of Namaqualand used for crafts (and other miscellaneous purposes), showing those with highest and lowest residual values in a regression analysis. Those exceeding the standard error of 2.47 are shown in bold.

Family	Number of craft species	Total number of species	Predicted	Residual
Families with the highest residual values				
Asteraceae	**32**	**366**	**19**	**13**
Geraniaceae	**14**	**77**	**4**	**10**
Anacardiaceae	**8**	**12**	**1**	**7**
Zygophyllaceae	**8**	**22**	**2**	**6**
Ebenaceae	**7**	**9**	**1**	**6**
Fabaceae	**11**	**114**	**6**	**5**
Amaranthaceae	**7**	**39**	**3**	**4**
Apocynaceae	**8**	**71**	**4**	**4**
Solanaceae	**5**	**23**	**2**	**3**
Euphorbiaceae	**6**	**47**	**3**	**3**
Families with the lowest residual values				
Oxalidaceae	2	60	4	−2
Poaceae	5	121	7	−2
Orchidaceae	0	21	2	−2
Scrophulariaceae	6	143	8	−2
Colchicaceae	0	24	2	−2
Campanulaceae	0	25	2	−2
Ruscaceae	**0**	**40**	**3**	**−3**
Hyacinthaceae	**4**	**144**	**8**	**−4**
Aizoaceae	**17**	**492**	**25**	**−8**
Iridaceae	**0**	**171**	**9**	**−9**

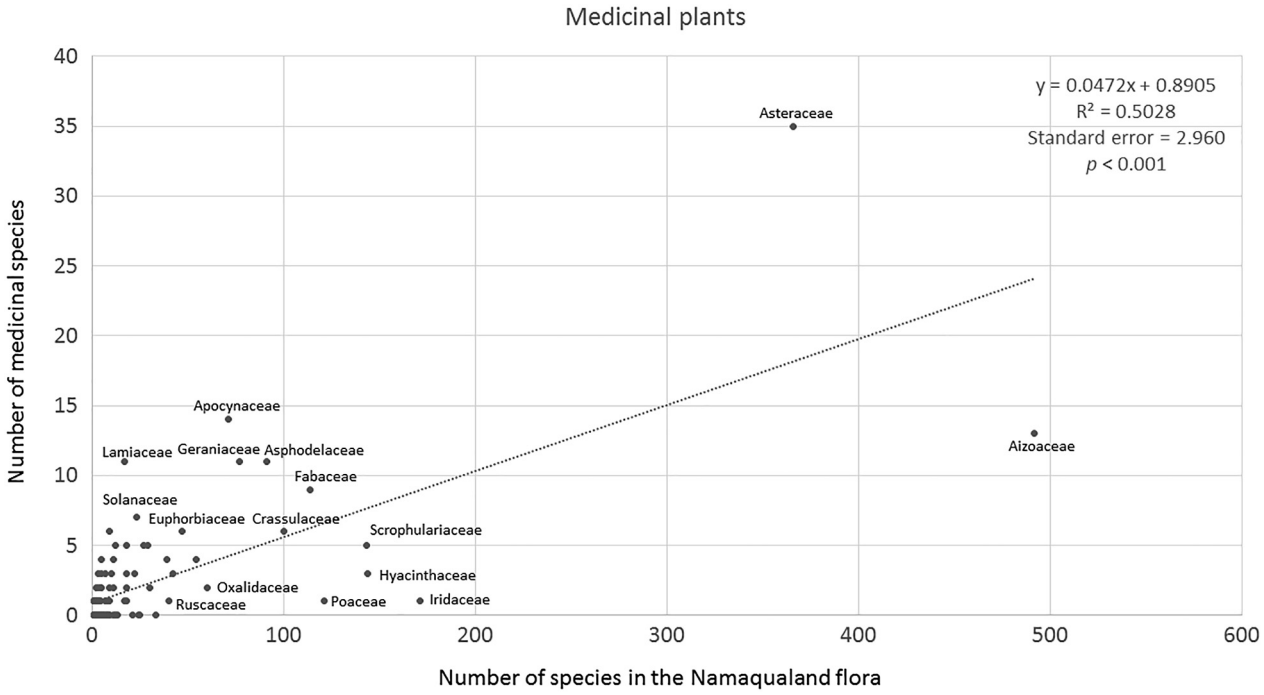

Fig. 4. Scatterplot of the families of vascular plants in Namaqualand, comparing the numbers of available species with the numbers that are used as medicine in Namaqualand.

and for crafts and other miscellaneous uses 0.6102, all with *p*-values below 0.001. These results show the degree to which the data are explained by the model. The values range from fairly low (food plants and medicinal plants) to fairly high (species with craft uses and miscellaneous uses). The scatter diagrams and residual values indicate that the selection of plant species is not random and is not directly related to the numbers of available species per family.

The results for medicinal plants are comparable to the overall result in terms of the dominant and under-selected families, although the sequence of families is somewhat different (Table 3; Fig. 4). The families with the highest residual values for medicinal plants are again Asteraceae (+17), Apocynaceae (+10), Lamiaceae (+9), Asphodelaceae (+6) and Geraniaceae (+6). Aizoaceae again have the lowest residual value (−11), followed by Iridaceae (−8), Poaceae (−6) and Hyacinthaceae (−5).

The most striking examples of non-random plant selection is evident among edible plants. Only 34% of the variance can be explained by the numbers of available species. Iridaceae and Apocynaceae stand out as

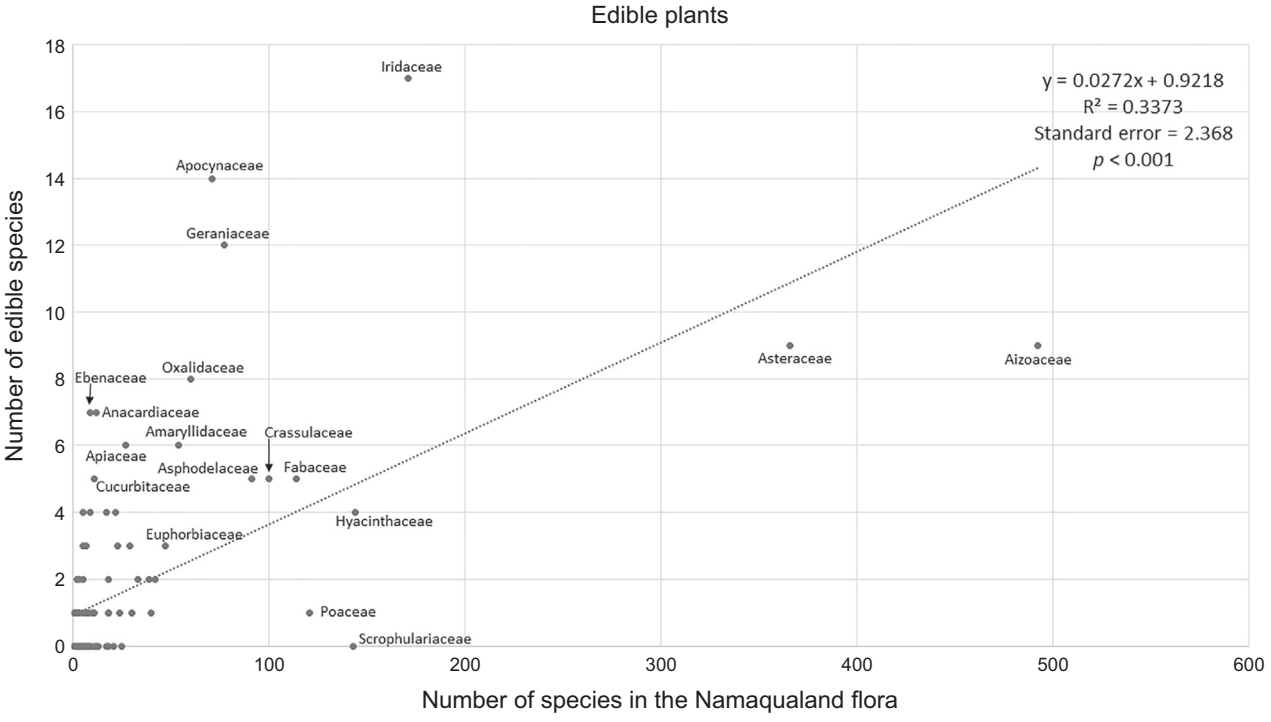

Fig. 5. Scatterplot of the families of vascular plants in Namaqualand, comparing the numbers of available species with the numbers that are used as food in Namaqualand.

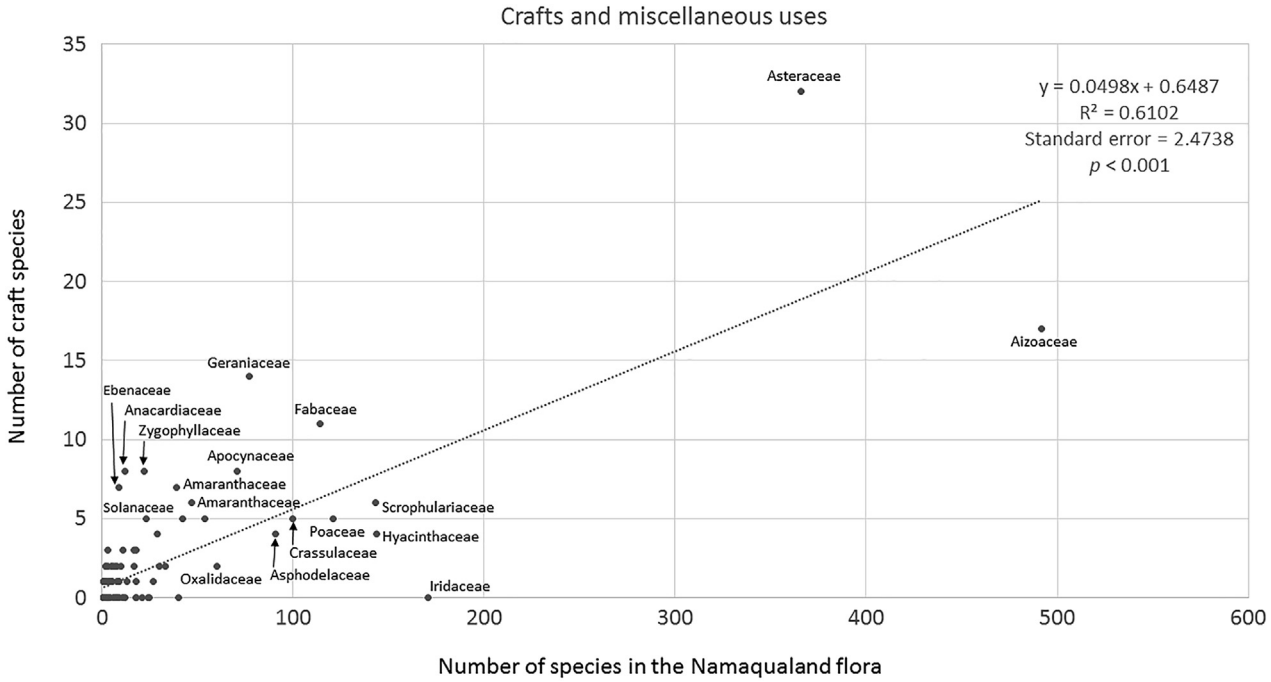

Fig. 6. Scatterplot of the families of vascular plants in Namaqualand, comparing the numbers of available species with the numbers that are used for crafts and miscellaneous purposes in Namaqualand.

the most species-rich families of edible plants in Namaqualand (Table 4), with 17 and 14 edible species respectively and both with a residual value of +11 (Fig. 5). They are followed by the Geraniaceae (+8), Ebenaceae (+6), Anacardiaceae (+6) and Oxalidaceae (+5). Most of these families are either entirely geophytic or include a large proportion of geophytic species (except for the Ebenaceae and Anacardiaceae, where the edible part is the fruit). The Apocynaceae include several edible stem succulents, hence their relatively high residual value. Plant life forms therefore appear to have played a major role in the selection of food plants in Namaqualand.

In terms of crafts and other miscellaneous uses, 61% of the variance can be ascribed to the number of available species. In this case the Asteraceae (+13) and Geraniaceae (+10) have the highest residual values. They are followed by families in which woody plants predominate, such as Anacardiaceae (+7), Zygophyllaceae (+6), Ebenaceae (+6) and Fabaceae, which provide a larger diversity of plant parts for use (Table 5, Fig. 6).

4. General conclusions

The data presented here are a first comprehensive checklist of ethnobotanically relevant vascular plants of Namaqualand. The inventory data that were needed for the regression analyses are presented in electronic format, and are thus available for verification and for more detailed and in-depth studies by future researchers. The Namaqualand flora includes at least 2902 indigenous and naturalised exotic species of vascular plants. The flora is dominated by Aizoaceae and Asteraceae but only the latter contains a large number of useful species. The Asteraceae, Geraniaceae, Aizoaceae, Apocynaceae, Iridaceae, Asphodelaceae, Fabaceae, Lamiaceae, Apiaceae, Oxalidaceae, Amaryllidaceae, Scrophulariaceae, Malvaceae, Solanaceae and Anacardiaceae are the families with the largest numbers of useful plant species. The families show different patterns of use, depending on the category of use. While Asteraceae are most prominent as both medicinal and craft plants, Iridaceae and Apocynaceae are favoured as a source of food, along with other families that have a high proportion of geophytes.

The regression analyses showed that the numbers of ethnobotanically relevant plant species are not in direct proportion to their numbers in a plant family. The inventory and scatter plots are a first step toward a better understanding of the early origins of medicine, food and craft materials in the Northern and Western Cape Provinces, at least for the last 2000 years. The results are also a testament to the durability of the knowledge held by the people of Namaqualand. Many questions remain to be answered. For example, how much information has been lost over time and how much knowledge have changed or perhaps increased with time? The results provide a baseline for further studies and provide some insights into the selection of plant species and the preferred plant life forms that were chosen by nomadic pastoralists to survive in a seasonally extreme habitat.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sajb.2019.03.039.

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