

A Review of the Chenopodiaceae in Papuasias

A. Kanis

Herbarium Australiense, CSIRO, P.O. Box 1600, Canberra City, A.C.T. 2601.

Abstract

Kanis, A. A Review of the Chenopodiaceae in Papuasias. *Contrib. Herb. Aust.* 20: 1-6, 1976. A critical enumeration is given and keys to the relevant three genera and five species, together with two more genera known from adjacent areas, are provided. Synonyms and misapplied names relevant to the region are given. Notes are made on the distribution and ecology of the species. It is shown that *Salicornia* L. and *Suaeda* Scop. have been recorded incorrectly for the region. All specimens examined for this study are listed.

INTRODUCTION

An earlier review of the Amaranthaceae in Papuasias (Kanis 1972, 1974) contained the major conclusions of pilot studies for a possible flora of Papua New Guinea and adjacent areas. To complete the publication of data relevant to that research, a list of specimens examined with their identifications is given separately (Kanis 1976).

The present paper on Papuasian Chenopodiaceae is similar to the ones mentioned above, in that it presents data and opinions relevant to a critical review for floristic purposes, but largely unsuitable for publication in an actual flora. Much of what has been written in the introductory notes to the earlier papers is also valid for this one. Generally speaking, the scarcity and poor quality of the collections available proved even more of a problem in the Chenopodiaceae.

Only the genera *Salsola* L. and *Tecticornia* Hook. f. appear to be indigenous to the region, both being represented by a single species. The taxonomic status of the species recorded, both introduced and native, can only be determined reliably in revisions with a much wider geographical scope. However, such revisions have not yet covered Papuasian Chenopodiaceae with the exception of *Tecticornia* (Wilson 1972). The most recent floristic treatment available for the region was the one in 'Flora Malesiana' (Backer 1949).

In the following key the genera *Arthrocnemum* Moq. and *Suaeda* Scop. have been included as, although unknown from Papuasias, they do occur in adjacent areas. It is quite possible that species of either genus will eventually be found in the region.

KEY TO THE GENERA OF CHENOPODIACEAE IN PAPUASIA

- 1a. Branches apparently jointed, \pm swollen, with opposite, very reduced leaves; inflorescences of sessile cymes of 3-5 flowers \pm concealed between bracts, combined into compound, compactly ovoid or cylindrical structures
- 2a. Inflorescences terminal, sometimes with 1 or 2 sessile lateral ones at base; bracts \pm free, half-circular, with thick outer rim 5. *Tecticornia*

- 2b. Inflorescences terminal and lateral, not sessile (terminal on short side branches); bracts of opposite pairs joined into faintly 2-lobed cup-shaped structures with thin outer rim 1. *Arthrocnemum*
- 1b. Branches not jointed, slender, with alternate, clearly developed leaves (lowest leaves sometimes opposite); inflorescences of single flowers or flower clusters, sometimes combined into compound but rather lax structures
 - 3a. Plants shortly hairy (elsewhere often mealy), often with glandular hairs; leaves ovate to narrowly lanceate, flat, mostly with distinct petioles; flowers without bracteoles 2. *Chenopodium*
 - 3b. Plants glabrous or almost so, without glandular hairs; leaves linear, \pm succulent, sessile; flowers with bracteoles
 - 4a. Leaves pungent; bracteoles similar to bracts, longer than perianth; tepals thickened across middle, in fruit usually with horizontally extending wing 3. *Salsola*
 - 4b. Leaves not pungent; bracteoles transparent, shorter than perianth; tepals not thickened, though in fruit \pm evenly succulent, without wing 4. *Suaeda*

1. ARTHROCNEMUM Moq.

- 1. *Arthrocnemum indicum* (Willd.) Moq., Chenop. Monogr. Enum. 113. 1840;
Salicornia indica Willd., Ges. Naturf. Freunde Berlin Neue Schriften 2: 111, t. 4,
 f. 2. 1799, *non vidi*.

This species is known from the tropical coasts of Africa and continental Asia. According to Backer (1949) it is also found in Malesia from Java through the Lesser Sunda Islands to Timor. A few species of this genus have been reported from the coasts of tropical Australia, one of which may well be conspecific with the Malesian material. It is also possible that this species — or a related Australian one — will be found in Papuaia, especially in places with a pronounced dry season.

2. CHENOPODIUM L.

KEY TO THE SPECIES OF *CHENOPODIUM* IN PAPUASIA

- 1a. Flower clusters combining into leafy thyrses as well as partly into terminal panicles; leaves subglabrous, covered with sessile yellow glands below, malodorous; stamens in bisexual flowers (1–)4–5; fruit at maturity concealed in tepals, with yellow glandular hairs in upper half and with (2–)3–5 stigmas 1. *C. ambrosioides*
- 1b. Flower clusters not combining into distinct compound inflorescences; leaves with short hairs, at least some tipped with yellow glands, aromatic; stamens in bisexual flowers 1(–2); fruit at maturity not concealed in tepals, glandless and with 2 stigmas
 - 2a. Tepals distinctly keeled with truncated triangular crest, giving perianth star-like appearance; seed distinctly keeled along most of circumference 2. *C. carinatum*
 - 2b. Tepals concave but not keeled; seed keeled along half of circumference only 3. *C. pumilio*

Note: Mr E. E. Henty (LAE) sent me the following information (personal communication): 'I have seen *C. ?album* at low altitude, from carrot seed, but it did not persist'. *C. album* L. in the traditional sense is usually regarded as a species-complex by modern authors. As no collection were made, the identity of this material remains uncertain. Material pertaining to this complex may be found again in the region, being among the most widely distributed agricultural weeds, especially of more temperate zones.

1. **Chenopodium ambrosioides** L., Sp. Pl. 219. 1753; Hartley, *Lloydia* 36: 246. 1973.

This species is of neotropical origin but it has become a weed of almost world-wide distribution. Backer (1949) reports it from the Philippines, Celebes and Java, but not from New Guinea. The first record for the region was listed by T. G. Hartley (1973). His relevant specimen in L was further identified by Paul Aellen as var. *ambrosioides* forma *angustifolium* (Moq.) Aellen.

The oldest Papuan collections I have seen were both collected in September 1962. Probably the species was introduced relatively recently, so far only spreading along native routes between the Central and Morobe Districts in eastern New Guinea. It was reported from open places along village tracks and river banks, from sea level up to 2000 m altitude.

Specimens examined

EAST NEW GUINEA: Central District: Kairuku Subdistrict, near Epo, Sept. 1962, *Pullen 3643* (CANB); Angabanga R. between Bebeo and Inawauni, Sept. 1962, *Pullen 3618* (CANB, LAE); Goilala Subdistrict, Torura, May 1971, *Stevens and Coode LAE 51459* (BRI, CANB, LAE); between Kuputivava and Omoretu, Feb. 1964, *Hartley 13049* (BRI, CANB, L, LAE). Morobe District: Lae Subdistrict, Garaina, Bubu R., July 1971, *Kairo NGF 24389* (LAE).

2. **Chenopodium carinatum** R.Br., Prodr. Fl. Nov. Holl. 407. 1810; Merr. and Perry, *J. Arnold Arbor.* 29: 154. 1948; Steen., *Fl. Males.* ser. 1, 4: 595. 1954.

This species is native to Australia and was collected once from Papuaasia: Morobe District, vicinity of Kajabit Mission, Nov. 1939, *Clemens 10814* (A). It was gathered from an open place near a village at c. 500 m altitude and it was reported to occur also as a weed of tobacco cultivation in the Markham Valley. It must have been introduced accidentally and it is uncertain whether it persists in the region. However, the rather dry climate of the Markham Valley should be relatively favourable to its survival.

The original identification by Merrill and Perry was later confirmed by the well known Chenopodiaceae specialist Paul Aellen, as shown by his determinavit label on the specimen.

3. **Chenopodium pumilio** R.Br., Prodr. Fl. Nov. Holl. 407. 1810; Steen., *Blumea* 15: 154. 1967; *Fl. Males.*, ser. 1, 6: 932. 1972.

This is another native Australian species once collected in Papuaasia: Morobe District, B.G.D. Leron Cattle Station, Aug. 1963, *Henty NGF 16668* (BRI, CANB, L, LAE). It was reported from a bare patch in grazed grassland at c. 150 m altitude. Its introduction into the region must have been accidental too and its locality is in the same general area as that of the previous species.

It has been suggested (P. G. Wilson, personal communication) that *C. carinatum* and *C. pumilio* are readily distinguished in the more southern latitudes of their distributional areas, but that they appear to intergrade in northern Australia. The two relevant collections from the Morobe District were clearly distinct and fairly typical of material under either name.

3. SALSOLA L.

1. *Salsola kali* L., Sp. Pl. 222. 1753; F. Muell., Descr. Notes Pap. Pl. 2: 28. 1886; Warb., Bot. Jahrb. 13: 303. 1891; Pulle, Nova Guinea 8: 349. 1910; Booberg, Bot. Jahrb. 66: 5. 1933; Back., Fl. Males. ser. 1, 4: 106. 1949; Steen., Fl. Males. ser. 1, 4: 595. 1954.

The name *S. kali* L. is applied here in a wide sense as is still customary in the Southwest Pacific. Elsewhere several specific and infraspecific taxa are recognized within this complex. The position and relationships of material from the region within the species complex has yet to be determined.

The occurrence of this species in Papuasias and adjacent areas is probably natural, though restricted to sandy beaches in areas with a pronounced dry season. It has been collected from localities along the southern coasts of New Guinea, and reported from the Aru Islands by Warburg (1891).

Specimens examined

WEST NEW GUINEA: South coast, near Okaba, Aug. 1907, *Branderhorst 10* (BO, L).
EAST NEW GUINEA: Western District?: 'islands in Torres Straits', *Hartmann s.n.* (MEL).
Central District: Idlers Bay, W. of Fairfax Harbour, June 1960, *Womersley and Thorne NGF 12568* (BRI). Milne Bay District: Milne Bay, 1889, *McGregor s.n.* (MEL).

4. SUAEDA Forsk. ex Scop., nom. cons.

1. *Suaeda maritima* (L.) Dumort., Fl. Belg. 22. 1827, *non vidi*; Backer, Fl. Males. ser. 1, 4: 105. 1949; *Chenopodium maritimum* L., Spec. Pl. 221. 1753.

S. nudiflora auct. non (Willd.) Moq. 1849: auctt. Males. (non Val., Bull. Dép. Agric. Ind. Néerl. 10: 9. 1907 = *Batis argillicola* P. Royen).

This species is known from Europe, North Africa and Asia, Australian material often being referred to var. *australis* (R.Br.) Domin, or a distinct but presumably related species *S. australis* (R.Br.) Moq. According to Backer (1949), *S. maritima* is known in Malesia from Java and Madura, and perhaps also from New Guinea.

A species of *Suaeda* might well be discovered in Papuasias, but so far no conclusive evidence has been found for its occurrence in the region. Backer's doubtful record very probably originates from Valetton's equally doubtful listing of *S. nudiflora*, based on two collections from Merauke in West New Guinea: N.G. Expeditie 1904-1905, *Dr J. W. R. Koch s.n.* (BO, L). This material has since been determined as *Batis argillicola* P. Royen (Bataceae) (1956b).

5. TECTICORNIA Hook. f.

1. *Tecticornia australasica* (Moq.) P. G. Wilson, Nuytsia 1: 280. 1972; *Halocnemum australasicum* Moq., Chenop. Enum. 110. 1840.

Halocnemum cinereum F. Muell., Fragm. Phytogr. Austral. 1: 140. 1859;
Salicornia cinerea (F. Muell.) F. Muell., *ibid.* 6: 251, 271. 1868; Descr. Notes Papuan Pl. 2: 23. 1885, quoad genus tantum; *Tecticornia cinerea* (F. Muell.) Baill., Hist. Pl. 9: 185. 1887, *non vidi*; Val., Bull. Dép. Agric. Ind. Néerl. 10: 9. 1907; Pulle, Nova Guinea 8: 349. 1910; Backer, Fl. Males. ser. 1, 4: 104, f. 1. 1949; P. Royen, Nova Guinea N.S. 7: 177, 180, f. 1-2, pl. 9-10. 1956.

In a recent revision of the genus, P. G. Wilson (1972) has recognized three species from Australia, of which only *Tecticornia australasica* extends into Papuasias. Backer (1949) also mentions a single record of the same species from East Java (*Hoogerwerf s.n.*) and it has since been collected in Sumbawa (*Soejarto 32*) and Timor (*Haantjes and van Es 10*). It is now known from West New Guinea near Jayapura and Merauke, and in East New Guinea from a few localities in the Central District.

The species is found on coastal mudflats, probably restricted to areas with a pronounced dry season. This habitat varies from dry to fully inundated with water of varying salinity. The species occurs in pure stands as well as mixed with grasses or other herbs. An extensive description of Papuasian material based on spirit collections and first-hand observations in the field was provided by P. van Royen (1956).

There is no doubt that the combination *Salicornia cinerea* was validly made by Mueller (1868) in an index with a reference to a page giving the basionym and indicating the author's intention. Only one collection from the region appears to have been labelled by him with that name: *Chalmers s.n.* (MEL). Very probably this was the record Mueller (1885) had in mind when listing *Salicornia* for New Guinea.

Specimens examined

WEST NEW GUINEA: Jayapura, Lake Sentani, *McKee 1915* (LAE); Merauke, Aug. 1904, *Koch s.n.* (BO, L), 3 (L); Nov. 1907, *Versteeg 1895* (BO, L); Dec. 1954, *McKee 1703* (L, NSW); Dec. 1957, *Kalkman BW 6226* (CANB, L); W. of Merauke, Jan. 1957, *BW s.n.* (L); path to Lampu Satu, Dec. 1955, *Boendermaker s.n.* (L); N. of Merau R., E. of Urum village, Sept. 1954, *van Royen 4827* (CANB, L). EAST NEW GUINEA: 1880, *Chalmers s.n.* (MEL); Central District: Kairuku Subdistrict, 7 miles NW. of Hsiu village, Aug. 1962, *Darbyshire 829* (BRI, CANB, LAE). Rigo Subdistrict: coast N. of Kapakapa, July 1962, *Pullen 3281* (CANB); Aug. 1962, *Schodde 2736* (BRI, CANB, LAE); coast near Kwikila, June 1962, *Pajmans 925* (CANB).

ACKNOWLEDGMENTS

I am grateful to the directors of the Rijksherbarium (L), the Division of Botany, Department of Forests, Papua New Guinea (LAE), the Queensland Herbarium (BRI) and the National Herbarium of Victoria (MEL) for making available their collections of Papuasian Chenopodiaceae, and to the director of the Arnold Arboretum (A) for the loan of *Clemens 10814*. I also thank Mrs B. Schmidt, Justus-Liebig-Universität, Giessen, for information about collections of *Batis argillicola*, at the time on loan to her from L.

LIST OF COLLECTIONS

Collections are arranged alphabetically by collectors' names and under these in numerical order. Those numbered in institutional series are listed under the series as well. Collection numbers are all followed by a colon and the number of the relevant species.

- | | |
|---------------------------------------|---|
| 1. <i>Chenopodium ambrosioides</i> L. | 4. <i>Salsola kali</i> L. |
| 2. <i>Chenopodium carinatum</i> R.Br. | 5. <i>Tecticornia australasica</i> (Moq.) |
| 3. <i>Chenopodium pumilio</i> R.Br. | P. G. Wilson |

B.W. (Boswezen) series: 6226 : 5; *Boendermaker s.n.* (12.1955) : 5; *Branderhorst* 10 : 4; *Chalmers s.n.* (1880) : 5; *Clemens* 10814 : 2; *Darbyshire* 829 : 5; *Hartmann s.n.* : 4; *Hartley* 13049 : 1; *Henty NGF* 16668 : 3; *Kairo NGF* 24389 : 1; *Kalkman BW* 6226 : 5; *Koch s.n.* (2.8.1904) : 5; 3 : 5. *LAE* series: 51459 : 1; *MacGregor s.n.* (1889) : 4; *McKee* 1703 : 5; 1915 : 5. *N.G.F.* (New Guinea Forests) series: 12568 : 4; 16668 : 3; 24389 : 1; *Paijmans* 925 : 5; *Pullen* 3281 : 5; 3618 : 1; 3643 : 1; *van Royen* 4827 : 5; *Schodde* 2736 : 5; *Stevens and Coode LAE* 51459 : 1; *Versteeg* 1895 : 5; *Womersley and Thorne NGF* 12568 : 4.

REFERENCES

- Backer, C. A. (1949). *Chenopodiaceae*. In 'Flora Malesiana'. Ser. 1. Vol. 4, pp. 99–106. (P. Noordhoff Ltd: Groningen.)
- Kanis, A. (1972). A review of the *Amaranthaceae* in Papuasia. *Contrib. Herb. Aust.* 1, 3–18.
- Kanis, A. (1974). Further notes on the *Amaranthaceae* in Papuasia. *Contrib. Herb. Aust.* 7, 7–13.
- Kanis, A. (1976). List of examined collections of Papuan *Amaranthaceae*. *Contrib. Herb. Aust.* 21, 1–4.
- Royen, P. van (1956a). Notes on *Tecticornia cinerea* (F.v.M.) Bailey (*Chenopodiaceae*). *Nova Guinea*, new ser. 7, 180–6, fig. 1–2, pl. 9–10.
- Royen, P. van (1956b). A new *Batidaceae*, *Batis argillicola*. *Nova Guinea*, new ser. 7, 187–95, Fig. 1–2, pl. 11.
- Steenis, C. G. G. J. van (1954). Addenda, corrigenda et emendanda (*Chenopodiaceae*). In 'Flora Malesiana'. Ser. 1. Vol. 4, pp. 594–5. (P. Noordhoff Ltd: Groningen.)
- Steenis, C. G. G. J. van (1972). Addenda, corrigenda et emendanda (*Chenopodiaceae*). In 'Flora Malesiana'. Ser. 1. Vol. 6, p. 932. (Wolters-Noordhoff: Groningen.)
- Wilson, P. G. (1972). A taxonomic revision of the genus *Tecticornia* (*Chenopodiaceae*). *Nuytsia* 1, 277–88, figs 1–7.

INDEX

Synonyms are shown in italics

	Page		Page
<i>Arthrocnemum</i> Moq.	2	<i>Salicornia indica</i> Willd.	2
<i>indicum</i> (Willd.) Moq.	2	<i>cinerea</i> (F. Muell.) F. Muell.	4
<i>Batis argillicola</i> P. Royen	4	<i>Salsola</i> L.	4
<i>Chenopodium</i> L.	2	<i>kali</i> L.	4
<i>album</i> L.	2	<i>Suaeda</i> Scop.	4
<i>ambrosioides</i> L.	3	<i>maritima</i> (L.) Dumort.	4
<i>carinatum</i> R.Br.	3	<i>nudiflora</i> auct. non (Willd.) Moq.	4
<i>maritimum</i> L.	4	<i>Tecticornia</i> Hook. f.	4
<i>pumilio</i> R.Br.	3	<i>australasica</i> (Moq.) P. G. Wilson	4
<i>Halocnemum australasicum</i> Moq.	4	<i>cinerea</i> (F. Muell.) Baill.	4
<i>cinereum</i> F. Muell.	4		