Family Ceratophyllaceae S.F.Gray, A natural arrangement of British plants 2: 554 (1821).

Aquatic herbs, monoecious, perennating by buds, free-floating; stems branched, often reddish. Leaves in whorls of 3–10, filiform, once or more dichotomously branched, often ± rigid and brittle, margins often spinose-dentate, lowest part sometimes swollen and ± sac-like (due to parasitic attack), apical segments truncate, 2-spined and with central reddish and glandular projection; stipules 0. Flowers unisexual, axillary, male 1(–4), female 1 per node, and male and female often at different nodes, ± sessile. Perianth lobes (8–)9–12(–15), united at base, some often joined in pairs to over halfway, strap-shaped or obovate, crenate to spiny wing, a pair of basal spines often present, apex 2-spined and glandular as leaves. Male flowers: stamens up to ± 30 in several whorls on domed torus around pistillode; filaments short or 0; anthers oblong, extorse; loculi 2, parallel, dehiscing longitudinally; connective produced into 2 apical spines and glandular projection; immature anthers flattened, resembling perianth lobes but margins 1–3-spined, mature anthers swollen, glandular projection detached, tissues becoming gas-filled, bearing detached anther to surface where it floats horizontally and projection detached, tissues becoming gas-filled, bearing.

Fruit: detached anther to surface where it floats horizontally and projection detached, tissues becoming gas-filled, bearing.
FIGURE 1.—Ceratophyllum demersum var. demersum, 1.1–1.3; 1.8, 1.9: 1.1, part of plant, × 7/5, Muuse 4269; 1.2, leaf, × 2, Musil 450; 1.3, leaf, × 2, Ward 6582; 1.8, female flower, × 8, Bogden 2333; 1.9, fruit, × 4, Ward 6582. C. muricatum subsp. muricatum, 1.4–1.7, 1.10, 1.11: 1.4, male flower, × 8; 1.5, male perianth segment, × 24; 1.6, immature anther, × 24; 1.7, mature anther, × 24; 1.10, position of stem showing leaf-whorl, × 7/5, all from Stephens 31; 1.11, var. echinatum: fruit, Van der Schijff 5672. Published with permission of Director, Royal Botanic Gardens, Kew.
thick, apical and often lower segments with many, rarely few, spine-tipped marginal teeth (0.1—0.2–0.5 mm long. Male flowers 1–3 per node, often many per branch, up to 2.5—(3.5) mm in diam.; perianth broadly cup-shaped, lobes 0.5–1.3 × 0.2–0.4 mm, glandular projection to 0.2 mm long; stamens: up to ± 30, anthers subsessile, 1—2 × 0.4–1.5 mm when mature; pistillode ± 0.6 mm long. Female flowers solitary, few per branch; perianth closely surrounding ovary, persistent in fruit, lobes resembling male, glandular projection to 0.7 mm long. Ovary to 1.0 × 0.6 mm, smooth; style usually over 2 mm long. Fruit dark green or red-brown at maturity, surface smooth or finely papillose; basal spines usually long and conspicuous, sometimes reduced or absent.

var. demersum

*Ceratophyllum oxyacanthum* Cham.: 504, t. 5, fig. 6b (1829); non Schur. *C. demersum* var. *oxyacanthum* (Cham.) K.Schum.: 748 (1894); Engl.: 178 (1895). Type: Berlin, 1829, *Chamisso* s.n., (B, holo.; K, photo. of holo.).

*C. tuberculatum* Cham.: 504, t. 5, fig. 6d (1829). Type: India, Tranquebar [Tranquebar], Feb. 1798, Klein 506 (3281) in Herb. Willd. 17546 (B-WILL, holo.; IDC Microfiche No. 7440–29/1267: 1.3–6).

Fruit very slightly laterally flattened and without marginal rim, (3.5—)4.0–5.5 × 3.0–3.5 mm; apical spine (1.5—)3.5–9.0 mm long; basal spines (0.5—)1.5–6.0 mm long; surface ± smooth, yellow-green becoming red-brown, with sparse or numerous slightly raised dark gland-dots. Figure 1.1–1.3; 1.8, 1.9.

Found scattered in Caprivi Strip (Namibia), Botswana (mainly towards north), Northern Province, Gauteng, Mpumalanga, Swaziland, Free State and coastal regions of Western and Eastern Cape; abundant along coastal region of KwaZulu-Natal (Figure 2); of almost worldwide distribution. Occurs in static to fast-flowing shallow or deep water, reed swamps, lakes, rivers, streams; tolerant of brackish estuarine conditions of high salinity but not found in coastal, highly alkaline pools.

Vouchers: Allen 416; Mauve 4269; Wurd 7491; Van Son 28791.

2. *Ceratophyllum muricatum* Cham. in Linnaea 4: 504, t. 5, fig. 6c (1829). Type: Egypt, Damietta, June 1821, Sieber s.n. [B, holo.; HAL, lecto. (designated in Les: 296 (1986); K, G, iso.!)].

*C. demersum* var. *muricatum* (Cham.) Hook.f. ex K.Schum.: 749 (1894).


Fruit markedly laterally flattened with marginal rim widened into ± entire or irregularly crenate to long-sin­nose wing, ellipsoid, 3.0–4.5 × 2.0–3.0(–3.5) mm; apical spine (1—)4—9 mm long; 2 basal spines (0.5—)2.0–6.0(–10) mm long; surface rarely smooth, usually with (few—) many small, rounded to ± elongate wart papillae up to 0.2 mm long or sometimes with spines up to 0.3 mm high. Figure 1.11.

Found in Mpumalanga and probably also elsewhere in southern Africa (Figure 3; see note below on non-fru­ting material); Senegal, Ghana, Chad, Sudan, Mozambique (fruit immature), India and Pacific Islands. Occurs mainly in slow-flowing or stagnant water including seasonal highly alkaline lakes and pools; not found in brackish estuarine conditions.

Voucher: *Van der Schijff* 5672.

Only one of all southern African specimens seen with 3–4 times dichotomous leaves was in fruit and was posi­tionally identified as *C. muricatum* subsp. *muricatum*. The identity of the remainder could not be determined for cer­tain and it is possible that some of them belonged to *C.*
submersum var. submersum, which occurs in parts of Africa in the same habitat and is vegetatively almost identical. A brief description of this taxon is therefore given below and it also appears in the key.

Sterile material with 3–4 times dichotomous leaves is found (rather rarely) in eastern KwaZulu-Natal and southern coastal regions of Western and Eastern Cape (Figure 3).

Vouchers (specimens without fruit): Levyns 752 (BOL); Levyns 755 (BOL); Wilmot-Dear (1985a) considered subsp. submersum (which corresponds to C. submersum as conceived here) to comprise three varieties, of which only the typical one is widespread and known from Africa. Les (1986) did not consider the other two varieties as distinct.

var. submersum

Fruit markedly laterally flattened with ± distinct longitudinal 'marginal' rim, ellipsoidal, 3.5 x 2.5–3.0 mm; apical spine 0.45–1(–2) mm long; surface rarely smooth, usually with numerous minute warty papillae especially along rim, giving prickly appearance.

Found in Cameroons, Zaire, east tropical Africa, perhaps southern Africa, Dominica, parts of Europe and Asia.

REFERENCES


CHAMISSO, L.K.A VON 1829. Aquaticae quaedam diversae affinitate


