SAGITTARIA L.

Leaves submerged, floating or emergent. Erect leaves differentiated into blade and petiote, blades linear to broadly ovate, by some species with sagittate base. Submersed leaves modified into phyllodia, usually linear, flat, terete or spongy. Inflorescence erect or floating, with 1 to 12 whorls containing usually 3 flowers each. The upper flowers usually male, the lower female or pseudobisexual with functional stamens. Petals 3, white, pink or yellowish or white with purple spot at the base. Carpels spirally arranged in a convex receptacle; style central; nutlets compressed, winged (usually not ribbed) and beaked, without lateral glands.

The genus *Sagittaria* is differentiated in two subgenera. The subgenus *Sagittaria* is nct typical for Southamerican tropics and it is typically dioecious. The subgenus *Lophotocarpus* contains the most part of the Brazilian species. They are usually polygamous. In the upper part of inflorescence there are male, unisexual flowers, in the lower part there are unisexual, female flowers and contemporarily perfect flowers with fertile pistils and with a ring of functional stamens. By some species *(S. rhombifolia, S. planitiana. S. pseudohermaphroditica)* all flowers are perfect, but the pistils in the male flowers are absortive.

KEY TO THE DETERMINATION OF THE **SAGITTARIA** SPECIES

1 (12) Pistillate flowers with sepals apressed or spreading, ocasionally perfect, their pedicels recurved and thickened in aggregate fruit (subgenus *Lophotocarpus*) — 2

2 (9) Leaf-blades never sagittate — 3

3 (4) Leaf-blades floating, never emersed, cordate with sharp lobes
1. *S. guyanensis*

4 Leaf-blades typically submersed or emersed, never floating, lanceolate, kidney-shaped or cordate without sharp lobes — 5

5 (8) Blades lanceolate, narrowly oval or cordate with blunt lobes, longer than wide; nutlets longer as 4 mm — 6

6 (7) Blades emersed, typically lanceolate or oval, only rare the biggest blades are lately oval or nearly cordate with indicated short lobes; filaments pubescent; achenes 5 — 7 mm long, wrinckled, not carinate
2. *S. rhombifolia*

7 Blades probably submersed, typically cordate with distinct, blunt lobes, filaments glabrous; achenes 4 — 4,5 mm long, distinctly carinate
3. *S. pseudohermaphroditica*

8 Blades kidney-shaped, cordate or broadly oval, as long as wide, usually broader than long; nutlets only 2 — 3 mm long, carinate
4. *S. planitiana*

9 Blades typically sagittate — 10

10 (11) Scape constricted at the whorls, pistillate flowers subsessile, achenes longer as 4 mm
5. *S. sprucei*

11 Scape not constricted, pistillate flowers obviously stalked, achenes shorter as 3 mm 6. *S. montevidensis*

12 Pistillate flowers with reflexed sepals, newer perfect, their pedicels typically ascending (subgenus *Sagittaria*)
7. *S. lancifolia*

1. **Sagittaria guyanensis** H.B.K. Nov. Gen. & Sp. 1:250, 1815.

Sagittaria guyanensis occurs in two subspecies. The subsp. **guyanensis,** from the tropical zone of New World, has the achenes plump, small, less than 2,5 mm long; the subsp **lappula** (D. Don) Bogin, from the Old World tropics, has the achenes compressed, large, more than 2,5 mm long.

1.a. **Sagittaria guyanensis** H.B.K. subsp. **guyanensis** (see Bogin, Mem. N.Y. Bot. Gard. 9(2):192, 1955). (Fig. 43)

Syn.: (According to Bogin, 1955)

Sagittaria echinocarpa Mart. Amoen. Bot. Monac. 6, 1829.

Alisma ancile Mart. et Steud. Nom. ed. 2, 1:49, 1840. Nomen nudum.

Sagittaria bracteata Willd. ex Kunth, Enum. Pl. 3:161, 1841. Nomen nudum.

Alisma echinocarpum (Mart.) Seub. in Mart. Fl. Bras. 3(1):105, 1847.

Sagittaria seubertina Mart. Fl. Bras. 3(1):110, 1847.

Echinodorus guyanensis (H.B.K.) Griseb. Fl. Brit. W. Ind. 505, 1864.

Lophiocarpus guyanensis (H.B.K.) Micheli in DC. Monogr. Phaner. 3:62, 1881.

Lophiocarpus seubertianus (Mart.) Micheli in DC. Monogr. Phaner. 3:64, 1881.

Lophotocarpus guyanensis (H.B.K.) J.G. Sm. Missouri Bot. Gard. Rep. 6:35, 1895.

Lophotocarpus guyanensis var. **echinocarpus** (Mart.) Buch. Pflanzenreich 4(15):36, 1903.

Lophotocarpus guyanensis var. **typicus** Buch. Pflanzenreich 4(15):36. 1903.

Lophotocarpus seubertianus (Mart.) Buch. Pflanzenreich 4(15):36, 1903.

Perennial. Common in New World tropics in sweet stagnant and slowly running waters and in persistently inundated bogs. Leaves first submerged, later floating on petioles (17) — 25 — (40) cm long. Floating blades cordate or ovately cordate, in the midrib (2) — 4,5 — (6,5) cm long and (1,5) — 5,5 — (8) cm wide, usually as wide as long or broader than long, at the base trimed with sharp lobes (1) — 2,5 — (3,5) cm long, so that the lenght of the blade from the tip to the end of the lobe is to 11 cm. Scape simple, floating or submerged, (12) — 35 — (50) cm long. Bracts connate at the base, (0,6) — 1,5 — (2) cm long and (0,3) — 0,5 — (0,8) cm wide, slightly thickened. Inflorescence with (2) — 4 — (6) whorls, the pistillate flowers in 1 — (4) lower whorls, rarely mature pistillate flowers intermixed with staminate flowers. Pistillate flowers with thickened and recurved pedicels (1,5) — 3 — (4) cm long, usually with a ring of functional stamens. Sepals triangular, 1 — 1,5 cm long and wide, during the ripening sepals enlarge and cover the aggregate fruit at maturity. Petals white, as long or unconspicuously longer than sepals. Staminate flowers on filiform pedicels (2) — 3,5 — (5) cm long, stamens 9 — 12, filaments (1,8) — 2,1 — (2,3) mm long, anthers ovate, 0,8 — 1,1 mm long. Aggregate fruit 1 — 1,3 cm in diameter, achenes numerous, (1,5) — 2 — (2,3) mm long and (1,3) — 1,6 — (2) mm wide, with 1 — 3 facial wings, on the facial and dorsal wings echinate or smooth.

NEOTYPE: Surinam, Hostman 870 (TCD), isotype (W, LE).

GEOGRAPHICAL AREA: West Indies, Mexico to Argentina, in the lowlands and in the mountains to the height of 900 m.

BRASIL: not nearly specified localities: Glaziou 13219 (C); Glaziou 12245 (C); Glaziou 14286 (C, LE); Burchell 9589 (LE); Burchell 9489 (LE); 1840, Blanchet 3118 (NY); Magdalena 1883, Tolima (LE); Lagoa Xiriry, 1927, Lutzelburg 20579 (R); forte São Joaquim, 1927, Lutzelburg 20590 (R); Vera Cruz, Igarapé, Lutzelburg 20907 (R); Retiro Muruay, Cayoa, 1927, Lutzelburg 21182 (R); **Amapá :** Rio Macacaoari, Macapá, 5-8-1951, Froes et Black 27242 (UB, IAN); Ambé, rio Pedreira, Macapá, 8-7-1951, Froes et Black 27313 (IAN); Rio Araguarí, Apurema et Uraguaína, 23-7-1951, Black et Froes 51-12390 (IAN); Rio Macacoari, Macapá, 5-7-1951, Froes et Black 27214 (IAN); Lagoa de Ambé, rio Pedreira, Macapá, 8-7-1951. Froes et Black 27398 (IAN); **Pará :** Fazenda Desterro et Fazenda Laranjeira, 15-3-1950, Black et Lobato 50-1967 (UB, IAN); Campo de Bom Princípio, Quatipuru, pH 6,8 — 7,3, 5-4-1963, Rodrigues 5124 (INPA); Rio Tocantins, Jacundá, 15-5-1951, Froes 27103 (UB, IAN); Cacaual Grande, Limpo Grande, 8-7-1952, Black 52-15540 (IAN); Ilha do Marajó, Menino Deus, 22-2-1950, Black ed Engelhard 50-9012 (IAN); Ilha do Marajó, Fazenda Menino Deus, rio Paracauary, 20-2-1950, Black et Engelhard 50-8900 (UB, IAN); Rio Arari, Ilha do Marajó, Fazenda Tuiuiu, 2-5-1950, Black, Ledoux et Stegemann 52-14373 (UB, IAN); Soure, rio Paracauari, Fazenda Genipapo, 14-3-1950, Black et Lobato 50-9140 (IAN); Bragança, 9-4-1955, Pires et Silva 4833 a (IAN); Municlpio de Capanema, Campo do Bentiví ou do Pereira, 2-4-1963, Rodrigues 5102 (IAN); São Miguel do Guamá, 23-8-1948, Dardano et Black 48-3202 (IAN); Soure, rio Paracauari, Fazenda Genipapo, 14-3-1950, Black et Lobato 50-9129 (IAN), Soure, rio Paracauari, Fazenda São Lourenço, 21-3-1950, Black et Lobato 50-9345 (IAN); **Roraima:** Boa Vista, 16-8-1951, Black 51-12555 (IAN): Boa Vista, Rio Branco, Kuhlmann 3598 (RB); **Maranhão:** 1959, Carvalho 104063 (RB); **Piauí:** Gardner 2738 (W, CGE); Lagoa Pajahu, 1914, Lutzelburg 386 (NY); **Pernambuco:** 1912, Lutzelburg 5956 (RB); Goiás : Varadão de Relampago, duas léguas de Carolina, 28-5-1950, Pires et Black 2427 (IAN); **Mato Grosso:** Salobra, Santos 42043 (R); Cáceres, 1911, Hoehne 4637 (R); Coxipó da Ponte, Cuiabá, 1911, Hoehne 3885 (R); Cáceres, 1911, Hoehne 4485 (RB); dtto, Hoehne 4484 (RB); **Minas Gerais:** Lagoa Santa, **Lagoa dos** Tavares, 6-4-1864, Warming 159 (C); Lagoa Santa, Warming 158 (C); Santa Terezinha, 9-2-1949, Macedo 1641 (RB); S. Terezinha, 8-4-1950, Macedo 2270 (C, BM, MO); Triângulo Mineiro, S. Terezinha, 26-3-1959, Castellanos 22407 (RB); Lagoa Santa, Santa Luzia, 14-4-1935, Barreto 1055 (RB).

Fig. 43. **Sagittaria guyanensis** H.B.K. var. **guyanensis:** A = the plant; B = the achene; C = the achene of subsp. **lappula.**

2. **Sagittaria rhombifolia** Cham. Linnaea 10:219; 1835. (Fig. 44)

Syn.: **Sagittaria affinis** Seub. in Mart. Fl. Bras. 3(1):111, 1847.
Sagittaria lagoensis Seub. & Warm. Vidensk. Meddel. Naturh. Foren. Kjoeb. 1872:113, 1872.
Sagittaria rhomboidalis Micheli in DC. Monogr. Phaner. 3:66, 1881.
Sagittaria pugioniformis var. **platyphylla** Micheli in DC. Monogr. Phaner. 3:78, 1881.
Sagittaria brevipedicellata O. Kuntze. Rev. Gen. 3:327, 1895.
Sagittaria pugioniformis var. **affinis** (Seub.) Kuntze Rev. Gen. 3(2):328, 1898.
Sagittaria pugioniformis var. **rhombifolia** (Cham.) Kuntze Rev. Gen. 3:328, 1898.
Echinodorus brevipedicellatus (O. Kuntze) Buch. in Engler, Pflanzenreich 4(15):29, 1903.
Sagittaria amazonica Huber Mus. Goeldi 5:314, 1909.
Sagittaria pugioniformis auct. non. L. Pl. Surin. 15, 1775.
Echinodorus lophotocarpi angustifolius Hort. A. Bleher Catalogue, Magé, Brazil, 1965, nomen nudum.

Perennial with horizontal rhizome. A very variable species growing in water to 100 cm deep, in shallow waters of lakes and swamps, in slowly running sweet waters and also in terrestrial forms in relatively dried soils. The submerged and terrestrial leaves linear, not differentiated in petioles and blades, or the blades only slightly indicated. The submerged leaves to 120 cm long, blades linear, 5,5 — 14 cm long and 0,2 — 1,5 cm wide. By the terrestrial forms the leaves 30 — 50 cm long usually with linear blades. Typical amphibious plants with emersed leaves 17 — 50 cm long, blades always longer than wide, lanceolate or narrowly lanceolate 10 — 20 cm long and 2

— 9,5 cm wide, ovate 9 — 12 cm long and 4 — 10 cm wide or ovately cordate 10 — 20 cm long and 6 — 15 cm wide, on the tip acuminate, on the base truncate, shallowly lobate or on both ends symetrically acuminate, usually pseudopenninerved. Scape simple, usually shorter as leaves, (20) — 60 — (90) cm long. Inflorescence with (3) — 5 — (10) whorls, the 1 — (2) lower whorls with pistillate flowers, often only unique female flower in the first whorl. Bracts connate at the base, (1,5) — 2,3 — (3) cm long and (0,4) — 0,6 — (0,9) cm wide, usually appressed to the scape. Pistillate flowers with recurved, markedly thickened pedicels (1,5) — 3 — (4) cm long, occasionally perfect, with a ring of functional stamens. Sepals 1 — 2 cm long, during the ripening sepals enlarge and cover least 1/2 — 2/3 of the aggregate fruit at maturity. Petals white or yellowish, rarely with a purple spot at the base, (1,5) — 2 — (2,5) cm long so that the corolla has to 6 cm in diameter. Staminate flowers with (2,5) — 5,5 — (8) cm long, filiform pedicels, unisexual with numerous stamens or pseudohermaphrodite with 9 — 12 stamens and several abortive pistils. Stamens 3 — 4 mm long, filaments usually unconspicuously pubescent, 2 — 3 mm long. Aggregate fruit (1,2) — 2,5 — (3) cm in diameter, achenes 2 — 3 times longer than wide, at maturity 5 — 7 mm long and 2 — 3 mm wide, longitudinally wrinkled, not strikingly carinate, with horizontal or obligue stylar beak 0,5 — 1,5 mm long.

LECTOTYPE: Brazil, Sellow (E), isolectotype (LE, K).

GEOGRAPHICAL AREA: Tropical South America, from Venezuela, Colombia and British Guiana to Paraguay. Mainly in lowlands, rarely in the mountains up to the height of 1200 m.

BRAZIL: not nearly specified localities: Brasília, Sellow, lectotype (E), isotype (K, LE); Riedel 665 (LE); Martius (M); Glaziou 22291 (BR, C, G, NY); Morro Pellado, 1901, Edwall (SP); Riacho, Aracruz, 7-7-1956, JGFS 43 (RB); Viana, rio Jacarandá, 31-8-1956, JGFS 94 (RB); **Roraima :** Nordbrasilien, Serra de Lua, Igarapé da Cigana, 1927, Lutzelburg 21304 (M); Rio Cantá, campina, 8-10-1951, Black 51-13862

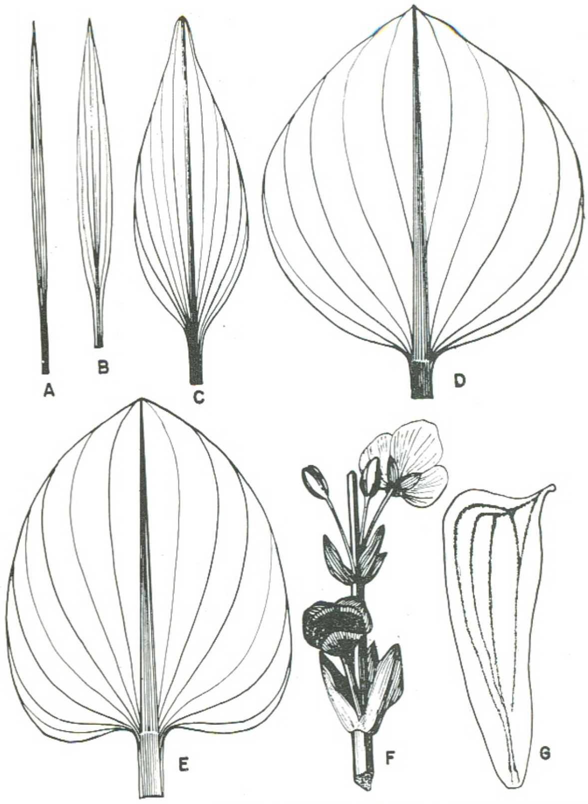

Fig. 44. **Sagittaria rhombifolia** Cham.: A — E = the blades; F = a part of inflorescence; G = the achene.

e 51-13862; (IAN); Prov. Normandia, Fazenda Guariba, 9.11.1954, Rodrigues 57 (INPA) **Pará :** Rio Camará, Fazenda Curupatuba, campo aberto, 9-7-1950. Black 50-9965 (IAN); Soure, Fazendinha, pasto com terrões, suculento, 1-2-1950, Black et Camargo 50-8839 (IAN); Ilha do Marajó, Fazenda Menino Deus, rio Paracauari, campo, planta suculenta, 20-2-1950, Black et Engelhard 50-8924 (IAN); Soure, entre las Fazendas Desterro et Cajueirinho, mondongo, 16-3-1950, Black et Lobato 50-9187 (IAN); campos inundados de Jutahy. Almeirim, 14-4-1923, Ducke 18588 (F, RB); Caminho para Jacerenim, Serra de Almeirim, 27-3-1963, Oliveira 2395 (IAN); Fazenda Santo André, município de Muaná, Ilha do Marajó, 5-4-1962, Penna 14 (IAN, UB); Bragança, campo alagado, 9-4-1955, Pires et Silva 4833 (IAN); **Amapá:** Amazônia, Oiapoque, 10-10-1949, Black 49-8516 (IAN); **Piauí :** in a small stream at Cagaceira, 1839, Gardner 2737 (K, US, BM); **Bahia :** Sümpfe bei Jesus do Rio das Contas, 1914, Lutzelburg 299 (M); **Minas Gerais :** S. Paraíso, Baú, 24-4-1945, Brade 17568 et Barroso (RB); inter Tejuco et Rio Paranahyba, 1861, Burchell 5817 (BR); Triângulo Mineiro, Lagoa Preta a Ituintaba, 27-3-1959, Castellanos 22425 (R); Carandai-Fumaça, 19-2-1946, Duarte 573 (RB); Lagoa Santa, Engler 158 (C); Lagoa Santa, Fischer 766 (LE); 1889. Glaziou 17781 (K, C, LE); Lagoa Preta, Rio Paraopeba, 31-3-1958, Heringer 6353 (UB); Lagoa Santa, 1915, Hoehne 6363 (R); Estação Experimental, Belo Horizonte, 2-8-1937, Barreto 9180 (F); in paludibus Varzea do Marçal, prope São João, 1896, Silveira (RB); Município Lagoa Santa, 835 m., 3-5-1952, Smith 6715 (R, F, IAN, NY); Lagoa Santa, 835 m., 3-5-1952, Smith 6715 et Dau (S, UC); Caldas, 1-2-1846, Widreen 806, 807 (S, BR, M, LD, C); *Goiás:* 1894-1895, Glaziou 22290 (G); Rio Preto, 1912, Lutzelburg 5991 (F, RB); Ule 7 (R); Lagoa Feia, 1892, Ule 216 (R, HBG); **Mato Grosso :** Cáceres, 1906, Hoehne 1134 (R); Hoehne 3891 (R); S. José, Rio Cuiabá, Mirim Aparte, 30-12-1893, Lindman (S); Campo Teles Pires, 1959, Sicko B 553 (RB); **Rio de Janeiro:** Teresópolis, Granja Comari, 850 m., 29-10-1962, Pabst et Abandroth 7161 (HB); **São Paulo:** Jundiaí, 14-3-1915, Brade 6470 (SP); Atibaia, 1910, Duarte 203 (SP); Campo Alegre, Córrego do Baú, 20-11-1940, Gehrt (SP); Pirassununga, 1941, Kleerekoper (SP); Franca, 3-1-1893, Löfgren et Edwall 2022 (SP); Jundiaí, 27-10-1907, Usteri 25187 (SP); **Paraná :** Desoio Ribas, in paludosis, 2-12-1910, Dusén 10926 (S, BM); **Santa Catarina :** Rio Caveiras, south of Lajas, 3-12-1956, Smith et Klein 8137 (R, US, NY); Porto União, bank of rio Iguaçu, 750 m., 19-12-1956, Smith et Reitz 8815 (R, UC).

3. **Sagittaria pseudohermaphroditica** Rataj Annol. Zool. Bot. Bratislava, 78:15, 1972 (Fig. 45)

Syn.: **Sagittaria cordifolia** Suess. et Beyerle Repert. Sp. Nov. 39:17, 1939.
non **Sagittaria cordifolia** Roxb. Fl. Ind. 3:647, 1832, quod est **Sagittaria guyanensis** H.B.K. subsp. **lappula** (D. Don) Bogin.
non **Sagittaria cordifolia** Lam. Encyc. 2:504, 1788, quod est **Echinodorus**

Perennial, usually submerged. On the rhizome 10 — 20 leaves (8) — 14 — (18) cm long, by the submerged plants always differentiated into petiole and blade. Blades lanceolate or ovate, usually typically cordate, 5 — 8,5 cm long and 2 — 5 cm wide, acute on the tip, abrupt or usually lobate at the base. Scape erect or reflexed, 8 — 15 cm ling. Inflorescence with 2 — 5 whorls, all flowers white-yellow, pseudobisexual. In the lower whorl 1 — 2 — (3) female flowers with a ring of functional stamens, the other flowers pseudobisexual, with usually 9 stamens and several abortive, not fertile pistils. Filaments glabrous. Aggregate fruit covered by sepals, 1,5 — 2 cm in diameter, achenes 4 — 5 mm long and 2 — 2,5 mm wide, not wrinkled with distinct, 1 — 2 lateral and 1 dorsal ribs.

HOLOTYPE: Brazil, Bahia West, Rio Femmeas, Sümpfe am Fluss, 1913, Lutzelburg 511 (M)

GEOGRAPHICAL AREA: Brazil, Bahia and São Paulo.

BRAZIL: **Bahia:** Bahia West, rio Femmeas, Sümpfe am Fluss, 1913, Lutzelburg 511, holotype (M); Sümpfe am rio Femmeas, 1913, Lutzelburg

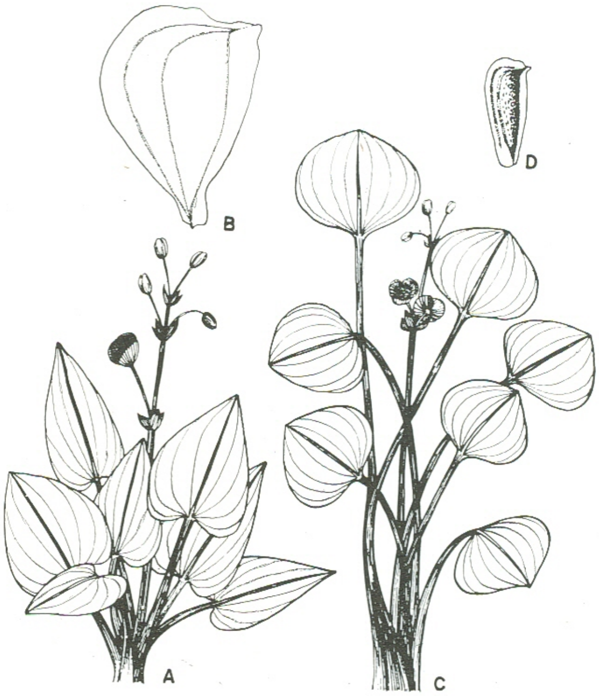

Fig. 45. **Sagittaria pseudohermaphroditica** Rataj: A = the plant; B = the achene. **Sagittaria planitiana** var. **microcarpa** (Rataj) Rataj; C = the plant with inflorescence; D = the achene.

559 (M); Sümpfe bei St. Desideratio, 1913, Lutzelburg 680 (M); **São Paulo :** 2-10-1898, Hemmendorf 146 (S); Município de Moji-Guaçu, Fazenda Campininha, 4 km NW of Padua Sales, 575-625 m., 22°11' — 18'S, 47°7, — 10'W, about 27 km NW of city of Moji-Mirim, open marsh, a dense growth of tall grasses and sedge with scattered herbs, 17-12-1959, Eiten 1639 (NY).

4. **Sagittaria planitiana** Agostini Phytologia 20:1, 1970.

Syn.: **Sagittaria venezuelensis** Rataj Ann. Zool. Bot. Bratislava, 78:17, 1972.

This species has two varieties. The *S. planitiana* var. *planitiana* grows in Venezuela.

4. a. *Sagittaria planitiana* var. *microcarpa* (Rataj) Rataj stat. n. (Fig. 45)

Syn.: **Sagittaria venezuelensis** var. **microspora** Rataj Ann. Zool. Bot. Bratislava, 70:19, 1972.

Leaves 20 — 25 cm long, blades broadly ovate, on both ends symetrically acuminate, with 9 — 11 veins, usually 4 cm long and 5,5 cm wide. Scape shorter as leaves, inflorescence with 2 — 3 whorls, in the lower whorl 2 pistilate flowers with a ring of functional stamens, male flowers pseudobisexual, with 9 — 12 stamens and several abortive pistils, filaments pubescent. Aggregate fruit 1,5 cm in diameter, mature nutlets 1,75 — 2 mm long and 0,75 — 1 mm wide, with very short, lateralelly inserted beak and with 1 — 2 ribs and distinctly elevated embryo.

HOLOTYPE: Brazil, Bahia, Barreiras, 24-12-1954, Black 54-17752 (AIN).

5. **Sagittaria sprucei** Mich. in DC. Monogr. Phaner. 3:80, 1881. (Fig. 46)

Perennial with horizontal rhizome. Endemic in shallow, stagnant and slowly running waters of Amazon Basin. Leaves typically emersed, (23) — 55 — (75) cm long, blades triangularly sagittate, prominently veined, in the midrib (5) — 15 — (20) cm long and (3) — 14 — (20) cm wide, with lanceolatcly

Fig. 46. **Sagittaria sprucei** Micheli: A = the plant with inflorescence; B = the achene.

triangular, sharp lobes to 12 cm long, so that the dimensions from the tip to the end of the lobe reach to 30 cm. Scape shorter or longer than leaves, (30) — 50 — (85) cm long. Inflorescence simple or branching at the lowest whorl, having (4) — 6 — (12) whorls of flowers, scape distinctly constricted at the nodes. Bracts connate at the base. Pistillate flowers on recurved, thickened, to 1,2 cm long or nearly absent pedicels, so that the flowers are subsessile. Sepals very short, often broader than long, 0,5 — 0,8 x 0,7 — 1 cm, during the ripening sepals enlarge and cover least a third of the aggregate fruit. Petals twice as long as sepals, white. Pistillate flowers unisexual (or with a ring of functional stamens?). Staminate flowers on relatively short 0,5 — 1,5 cm long pedicels, flowers usually unisexual, with 9 — 12 stamens with glabrous filaments and ovate anthers. Stamens 3 — 4 mm long, filaments longer than anthers. Aggregate fruit 1,5 — 2 cm in diameter, achenes 4 — 6 mm long and 2,5 — 4 mm wide, usually curved with a dorsal and a ventral wing. Laterally inserted, variously curved stylar beak 2 — 2,5 mm long.

HOLOTYPE: Brazil, prope Barra (Manaus), Rio Negro, Spruce 1855 (K); isotype (K, G, OXF, W, BM, TCD, CGE, C, NY).

GEOGRAPHICAL AREA: Amazon Basin, Colombia, Brazil, Peru.

BRAZIL: **Pará**: Taperinha, Paraná do Itaqui, região do Planalto de Santarém, 5-11-1954, Froes 31130 (IAN); Belém, 1-7-1935, Drouet 1958 (F). **Amazonas**: Manaus, Spruce 1855, holotype (K), isotype (K, G, OXF, W, BM, TCD, CGE, C, NY); Município do Careiro, Lago Redondo, 3-1-1964, Marlier (INPA); Amazonas expedition, Lago do Boto, Fortaleza, Rio Juruá, 1901, Ule 5949 (G, HBG); *Amazonas*, Caldeirão, 1877, Joubert 599 (R).

6. **Sagittaria montevidensis** Cham. et Schlecht. Linnaea 2:156, 1827.

Perennial in tropics and warm-temperate zone, annual in temperate zone. Leaves variable, with submerged, floating and typically emersed blades. Submerged blades modified into phyllodia 10 — 45 cm long and 0,5 — 1,2 cm wide, occassionally with spathulate ends to 3 cm wide. Floating leaves linear, ovate or sagittate to 5 cm long. Emersed blades typically sagittate, only rarely with the subsp. *chilensis* and with the North American subspecies narrowly lanceolate or spathulate. Scape simple or branching in the lower whorl. Bracts connate, pistillate flowers with thickened, recurved pedicels, sepals appressed to the aggregate fruit, petals white or yellowisch, usually a purple spot at the base, by the South American subspecies usually unisexual, without functional stamens. Staminate flowers on filiform pedicels, stamens 12 to numerous, with dilated or linear, pubescent or glabrous filaments. Achenes 1,5 — 2,5 mm long and 0,6 — 1,5 mm wide, narrowly winged, laterally or obliquely inserted stylar beak 0,3 — 0,6 mm long.

Four subspecies, two in North America, two in South America, only one occurs in Brazil.

6.a. **Sagittaria montevidensis** H.B.K. subsp. **montevidensis** (Fig. 47)

Syn.: **Sagittaria pugioniformis** var. **montevidensis** Kuntze Rev. Gen. 3:328, 1898.
Sagittaria multinerva Larranga Escrit. Larr. 1:1, 1922.

Perennial with short rhizome. The typically emersed leaves 50 — 90 cm long, blades sagittate, in the midrib (10) — 15 — (20) cm long and (10) — 15 — (25) cm wide, lobes linear or nearly divergent, to 15 cm long, so that the length from the tip of blade to the end of the lobe reachs to 30 cm. Scape as long or unconspicuously longer than leaves, simple or brancing at the lowest whorl, inflorescence with (3) — 7 — (12) whorls. Bracts connate at the base with attenuate ends, to 2,5 cm long. Pistillate flowers usually unisexual, only rarely with a ring of functional stamens, with thickened, recurved pedicels (1) — 3 — (7) cm long, sepals broadly ovate, 1 — 1,5 cm long and wide. During ripening sepals enlarge and cover one-half of the aggregate fruit at maturity. Petals ovate, 1,8 — 2,3 cm long, white or yellow with a purple spot at the base. Staminate flowers with filiform pedicels to 4 cm long, with 12 to many stamens, filaments usually pubescent, to 5 mm long, anthers oblong 0,75 — 1,25 mm long. Mature aggregate fruit 1,5 — 2,5 cm in diameter, achenes 2 — 3 mm long and 1 — 1,5 mm wide, with or without resin duct.

NEOTYPE: Argentina, Estancia prope Córdoba, 1874, Lorentz 103 (W), isoneotype (Z, BR, M, G).

GEOGRAPHICAL AREA: Warm-temperate South America, east of the Andes, in sweet et saline waters from lowlands to the height of 1200 m. Introduced or adventive and established northwards in the tropics to coastal Ecuador.

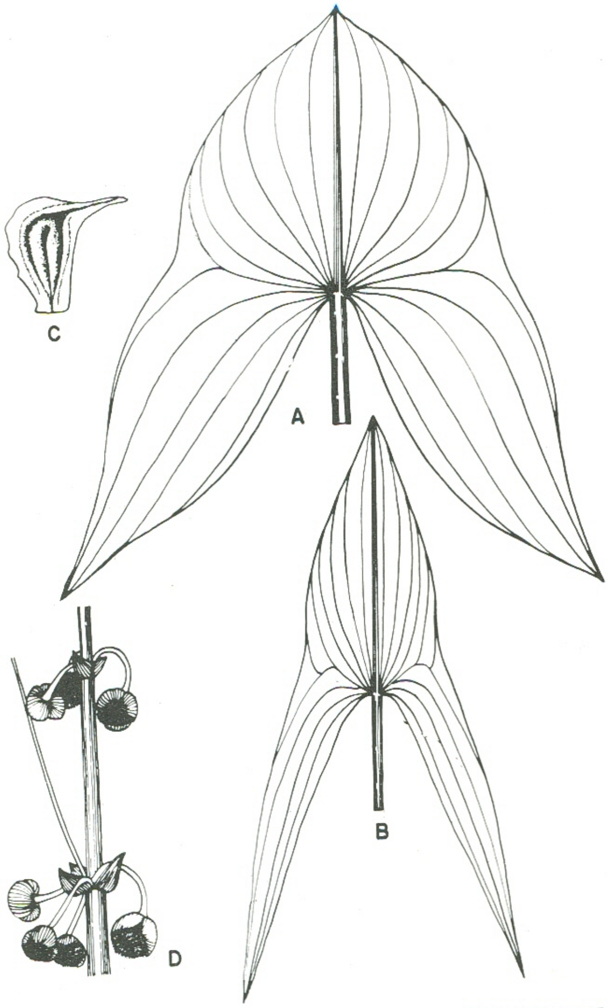

Fig. 47. **Sagittaria montevidensis** Cham. et Schlecht. subsp. **montevidensis:** A — B = the blades; C = the achene; D = aggregate fruits with recurved pedicels.

Cultivated in Botanical Gardens, introduced or adventive in Africa, Asia, Australia and Florida in the U.S.A.

BRAZIL: not nearly specified localitis: South Brazil, Tweedie, (E); Brazil, Glaziou 10107 (C); Brazil, Riedel (LE); Bras. merid., Sellow (LE); **Brasília, D.F.:** Horto do Quará, 18-7-1961, Heringer 8482 (UB, HB); **Minas Gerais:** Juiz de Fora, 1949, Roth 1790 (RB); **Paraná:** Parque Nacional de Iguaçu, 9-2-1960, Pereira 5170 (HB); **Rio de Janeiro:** Bleher 167-62 (K); Munic. de Cabo Frio, 17-4-1952, Smith 6635 (R, NY); Fazenda Quialle, Teresópolis, 17-9-1942, Emidis 579 (R); Campos, 1882, Galvas 674 (R); Jardim Botânico, 1923, Bailey et Bailey 771 (BH); rio Gunadu, Itaguaí, Pabst 29521 (HB); Teresópolis, Granja Comari, 850 m., 28-10-1962, Pabst et Anderdroth 7161 (HB); Estrada de Itaguaí, 28-4-1963, Pereira 65 (HB); **Guanabara:** Açude da Solidão, Guanabara, 11-5-1966, Guimarães, Ichaso et Sucre (RB); **Rio Grande do Sul:** Granja do St. Paulo, Simões Lopes-Pelotas, 13-3-1957, Sacco 619 (F, PEL); Lagoa dos Quadros, 1943, Klecricoper 393-43 (F, RB); dtto, Klecricoper 397-47 (NY); entre Guaíba, arroio dos Ratos, 30-10-1961, Pereira 6594 (RB); Sta. Maria, Brejo próximo Vacacai, 13-7-1958, Lima 58-3207 (IPA); Belém Novo, pr. P. Alegre, 31-12-1948, Rambo 39379 (BR, F, W); Belém Novo. Munic. Porto Alegre, 1929, Jürgens 324 (B); Porto Alegre, 7-11-1892, Lindman A 719 (S); São João, P. Alegre, 1898, Reineck et Czermak 691 (G); entre Guaíba à Arroio dos Ratos, 30-10-1961. Pabst et Pereira 6594 (HB); Esteio, prov. P. Alegre, 1-6-1949, Rambo 41610 (CM); São Leopoldo, 1941, Leite 440 (NY); Fazenda Soledade, Município Rio Pardo, 1926, Jürgens 233 (B); **Santa Catarina:** in Sümpfen des Campo d'una Laguna, Ule 1380 (HBG); Cerar, Sombrio, 11-4-1944, Reitz 501 (RB); **São Paulo:** Villa Galvão, 8-5-1933, Ostermeyer (SP); Morro da Enseada de Iguapé, 25-7-1904, Usteri (SP); Pinheiros, beira de Rio Pinheiros, 31-5-1933, Gehrt (SP); São Paulo, 1942, Sandeman 2004 (OXF).

7. **Sagittaria lancifolia** L. Syst. Nat. ed. 10(2):1270, 1759. (Fig. 48).

Perennial with big rhizome. The submerged phyllodia occur only by the young seedlings and are to 50 cm long. Typically emersed leaves to 150 cm long, blades linear to eliptical, leather-like, usually pseudopenninerved, 10 — 35 cm long and 0,5 — 19 cm wide, on the top acute or blunt, on the base slowiy decurrent. Scape usually longer than leaves, 50 — 200 cm long, inflorescence simple or branching at the lowest whorl with 5 — 12 whorls of flowers. Bracts 1 — 3,5 cm long, unconspicuously connected at the base; bracts and sepals striate or papillose. Pedicels 1 — 5 cm long, sepals 0,7 — 1,2 cm long, petals white, 1,5 — 2,5 cm long. Stamens numerous, 2,5 — 7,5 mm long, filaments linear, pubescent, about twice as long as anthers. Aggregate fruit 1 — 2 cm in diameter, achenes 1,5 — 2,5 mm long and 0,8 — 1,2 mm wide, with dorsal and facial wings and with a oblique stylar beak 0,3 — 0,7 mm long.

In Brazil, only the *S. lancifolia* subsp. *lancifolia* occurs.

7.a. **Sagittaria lancifolia** subsp. **lancifolia**

Syn.: supplemented according to Bogin (1955)
Sagittaria pugioniformis L. Pl. Surin. 15, 1975.
Sagittaria acutifolia L. f. Suppl. Sp. Pl. 419, 1781, non **Sagittaria acutifolia** Griseb. Cat. Pl. Cub. 218, 1866, quod est **S. intermedia** Micheli, non **Sagittaria acutifolia** Pursh. Fl. Amer. Sept. 2:397, 1814, quod est **S. graminea** Michx. var. **graminea.**
Sagittaria ovata Redouté Liliaceae 7:411, 1813.
Sagittaria angustifolia Lindl. Bot. Reg. 14: pl. 1141, 1828.
Sagittaria sellowiana Kunth Enum. Pl. 3:159, 1841.
Sagittaria lancifolia var. **angustifolia** (Lindl.) Griseb. Cat. Pl. Cub. 218, 1866, p.p.
Sagittaria lancifolia var. **major** Micheli in DC. Monogr. Phaner, 3:73, 1881.

Blades narrower as by the subsp. *media*, usually linear, 10 — 15 cm long and 0,5 — 3 cm wide or elliptical, 12 — 25 cm long and 3 — 7 cm wide. Bracts to 3,5 cm long, striate, sepals striate or ribbed. Filaments 2 times longer than anthers. Grows in shallow stagnant and slowly running waters.

TYPE COLLECTIONS: Several specimens in Linnaean herbarium.

GEOGRAPHICAL AREA: Common in Florida and Georgia, in West Indies and in South America from Venezuela and Guiana to the Amazon Basin in Brazil, sporadically in Central America, Mexico, Louisiana, Arkansas and Texas, where both the subspecies of *S. lancifolia* meet.

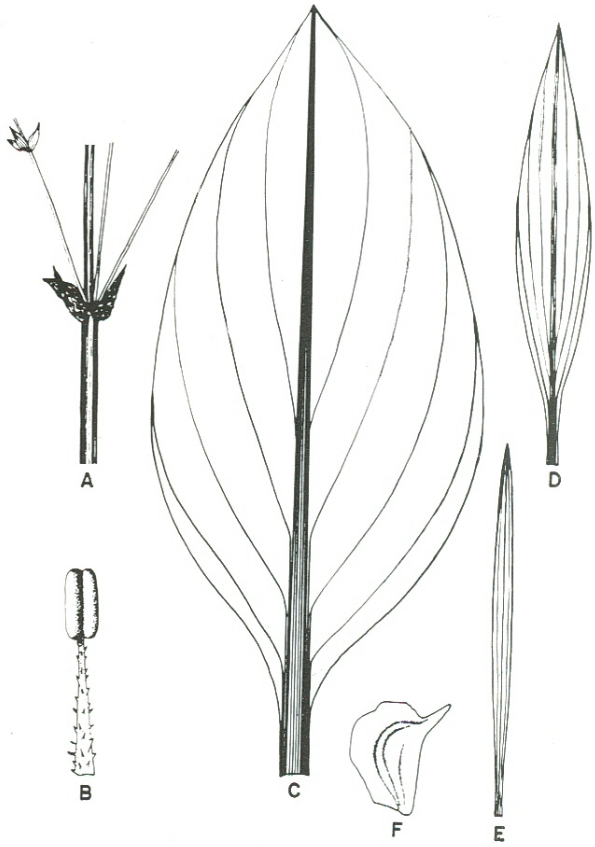

Fig. 48. **Sagittaria lancifolia** L.: B = the stamen of subsp. **lancifolia;** C, D, E = the blades; F = the achene; A = the bracts of subsp. **media** (Micheli) Bogin.

BRAZIL: 1815 — 1817, Sello 665 (BM); **Amapá:** Fazenda Mungubas, 21-4-1950. Black 50-9533 (IAN); **Pará:** Eagre (BM); **Pará:** Burchell 10036 (BR); Rio Pará, Pinheiro, Munic. de Belém, 16-7-1935, Drouet 2082 (F); Munic. de Belém, 17-7-1935, Drouet 2095 (F); **Paraíba:** 18-10-1959, Coraes 2274 (UC, NY); **Pará**, 27-10 - 7-11-1929, Killip et Smith 30629 (NY); **Brasília,** Martius (M); **Rio de Janeiro:** Cabo Frio, 1951, Poland 82087, introduced? (RB); **Rio de Janeiro:** Quinta da Boa Vista, 1908, Hoehne 24600, cultivated? (SP).