HAMBU, TYPHA JAVANICA SCHNIZLEIN

A WEED OF IRRIGATION IN CEYLON, RECENTLY PROCLAIMED A DECLARED WEED UNDER THE PLANT PROTECTION ORDINANCE

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THE new irrigation schemes in the dry zone are likely to raise new biological problems. The environment is made more suited for plant growth and with the change a new succession of natural vegetation sets in. Unless proper precautions are taken to regulate this succession, weeds likely to become troublesome may appear. One of the most undesirable weeds of irrigation at present is *hambu* (*Typha javanica* Schnizl.)

In the May number of this journal an account was given of *Gomphrena decumbens* Jacq., a weed new to Ceylon, and likely to spread rapidly and cause immense damage, particularly to grazing grounds and future pastures, unless checked at once; in the June number, of *Limnocharis flava* (L.) Buchenau, a weed of rice fields, recently naturalized in Ceylon, and menacing rice cultivation. Both plants are exotics: the first, introduced from South India, with hay in horse-trucks or with grain, by the railway; the second, it is said, escaped from a private ornamental pond where it had been cultivated some fifteen years ago. These exotics come to assume pest proportions because, as stated in the May number, " a weed introduced to a new land is not in equilibrium with its environment: its natural competitors may be absent and if soil, climate and other conditions prove suitable, in the absence of its natural checking influences, the weed may spread and spread and overrun its newly-found home. "

Hambu is an indigenous plant occurring in tanks and lagoons, in riverine estuaries and marshy places. Here again is an exhibition of the same ruling principle in nature: instead of an alien plant finding a favourable home in this Island, an indigenous plant finds a changed environment ideally suited to its requirements. Seeds carried by water, or wind-blown from an infested tank to a newly opened channel, germinate on the bare

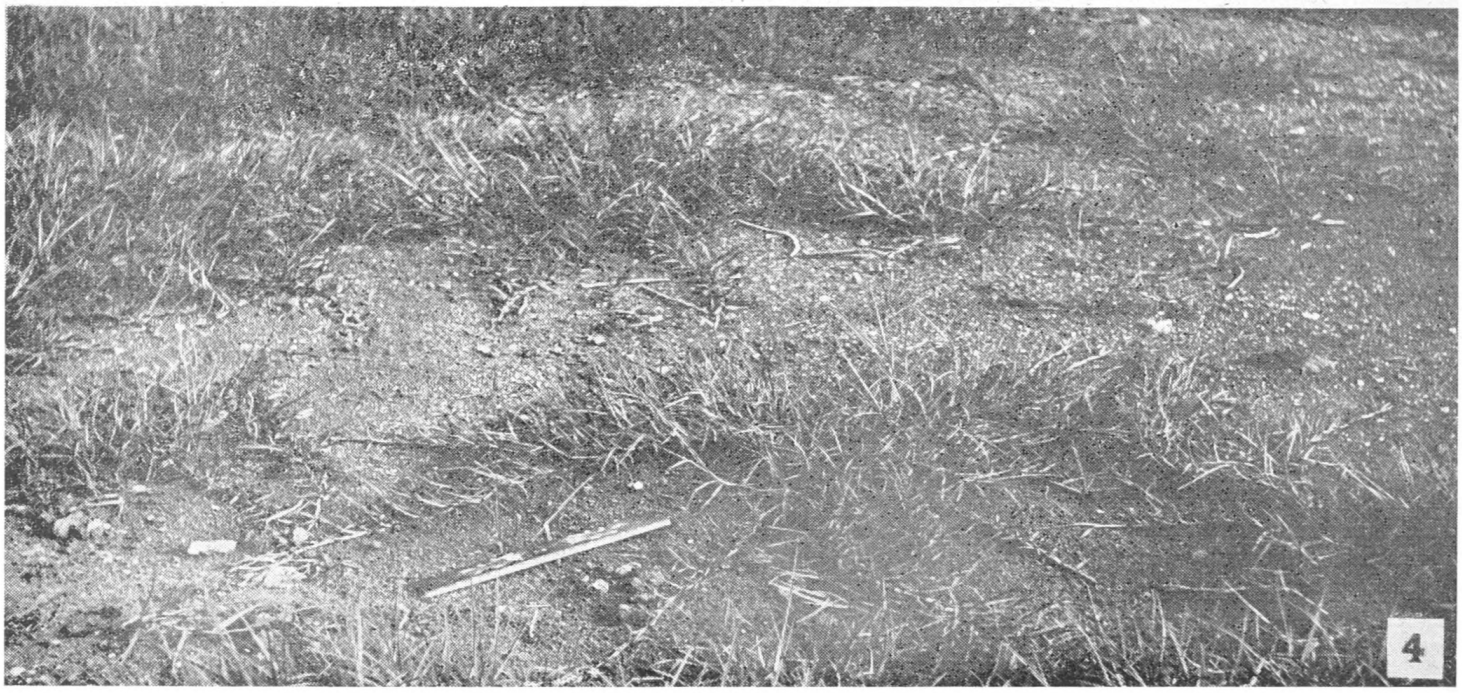

Photo by J. E. Senaratna *Block by Survey Dept.*

PLATE III.

Fig. 1.—*Hambu* in water, in tank (Epalogama).
Fig. 2.—*Hambu* on bank of water-course (Tabbova).
Fig. 3.—*Paspalum dilatatum* at Nikaveratiya.
Fig. 4.—Kikuyu grass six weeks after planting (Peradeniya. The scale is $14\frac{1}{2}$ inches long).

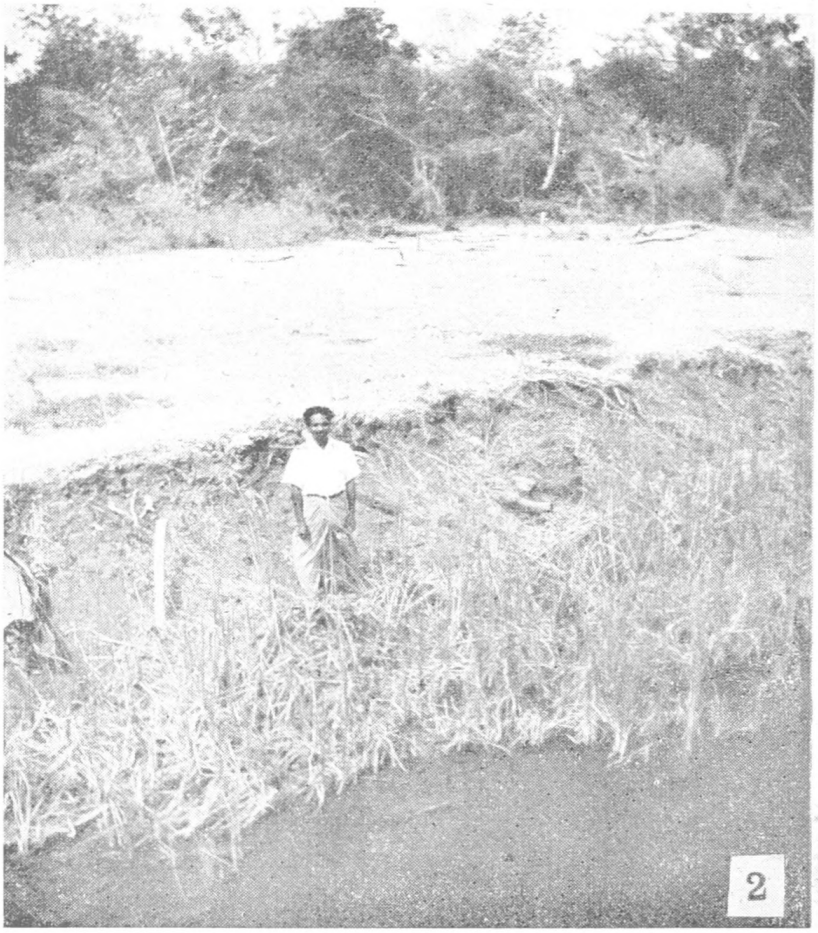

Photo by J. E. Senaratna *Block by Survey Dept.*

PLATE II.

Fig. 1.—*Hambu* in a tank (Epalogama, July, 1940).
Fig. 2.—*Hambu* in a water-course) Tabbova, July, 1940).
Fig. 3.—Habit of *hambu*.

soil just above water-level and the plants grow rapidly and spread vegetatively to form tufts which soon unite into long continuous masses of the reed along the shallower parts and banks of the channel which the weed causes to silt up gradually.

In appearance, *hambu* resembles luxuriant *illuk* grass, *Imperata cylindrica* (L.) Beauv., and is 4 to 8 feet high, but the female flower spikes are very conspicuous in their cylindrical form and characteristic cinnamon-brown colour, and the erect leaves show a very gradual spiral twist (of obvious advantage in wind-swept habitats).

Family : Typhaceae.

Typha javanica Schnizl. ex Zoll. Verz. Ind. Arch. Pfl. p. 77 (1854) ; Rohrb. in Verh. Bot. Ver. Brandenburg XI, p. 98 (1869) ; (as a subspecies of *Typha angustifolia* L.) Graebner in Engl. Pflanzenreich IV. viii, p. 13 (1900) ; *Typha latifolia* Moon Cat. Pl. Ceyl. p. 61 (1824), non L. ; *Typha angustifolia* Thw. Enum. Pl. Ceyl. p. 331 (1864), non L. ; *Typha elephantina* Thw. loc. cit., pro synon., non Roxb.

Local names : hambu (Sinhalese) ; sampu, (sāppai in the Batticaloa District) (Tamil). The above names are also used with the suffix '–pan'. "Bulrush" has sometimes been used for the plant but as the term also denotes the genus and several species of it and other plants such as *Cyperus Papyrus* L. and *Scirpus lacustris* L., to avoid confusion it is best to use the local name "*hambu*", just as the *Typha* species of Australia are known there by the local name "*cumbungi*".

Description : A tufted, perennial, glabrous, aquatic, marsh or lacustrine herb, generally gregarious, with conspicuous, erect, aerial stems and leaves, and a system of underground rhizomes with fibrous roots ; *rhizomes* of two kinds : at the base of aerial stems, short, stout, erect, rhizomes with crowded nodes and solid with reserve food ; and arising from these, on either side, narrow, cylindrical, horizontal, stolons up to 3 feet or more long and 1/3 to ½ inch in diameter, of white spongy tissue with a central vascular axis about 1/8 inch in diameter, with nodes 2 to 3 inches apart but shorter at the base and apex and scaly leaves about 2 inches long, turning upwards and thickening at the apex to give rise to an aerial stem ; *roots* fibrous, of three kinds : from the stout, erect rhizomes, (1) long, stout, anchoring roots with many thin laterals, (2) absorbing roots similar to the anchoring roots but floating and with a dense mass of innumerable, fine short laterals packed tightly together all round the root giving it a bottle-brush-like appearance, the upper side sometimes covered with epiphytic algae which impart to it a greenish colour ; and from the slender, horizontal stolons (3) short, thin, adventitious roots arising round the stem generally

at the nodes; *aerial stems* erect, unbranched, terete, smooth, solid, generally submerged at base up to 3 feet or less, 4 to 8 feet high, 3 to 5-noded, with internodes about 6 inches long, ending in inflorescences; innovations extravaginal; *leaves* distichous, linear, erect, rising above the water, mostly basal, about the same length as the aerial stems or shorter or longer; *leaf sheaths* entirely clasping the stem, with sides overlapping, sometimes with one side fused with the adjacent side of the opposite sheath, up to half an inch thick, containing much aerenchyma, gradually narrowed upwards, up to 2 feet long, with apex auricled or not; *leaf blades* linear, 3 to 8 feet long, 1/5 to 4/5 inch broad, containing much aerenchyma, base semi-elliptic in section with very narrow firm margins directed inwards, gradually merging to narrowly biconvex isobilateral, with a very gradual spiral twist of 3 to 5 turns, bluntly acute at apex, with margin entire, veins parallel and inconspicuous; *inflorescences* terminal, superposed, with flowers densely crowded into compact spikes, subequal in length, 4 to 12 inches long, with longer caducous bracts; the lower spike (one, seldom two, separated by a gap of about an inch) female, cylindrical, holosericeous, 1/3 to 2/3 inch in diameter, cinnamon-brown in colour; the upper (one) male, terete, 1/5 to $\frac{1}{2}$ inch in diameter, sometimes continuous with the female but generally separated by a gap of 1/3 to $1\frac{1}{2}$ inches, male flowers deciduous soon after anthesis; *male flowers* with simple, or more usually forked, hairs (bracteoles) which before anthesis and beyond the anthers are curved and subapically flattened and reddish brown in the flattened part; stamens usually 3, sometimes 1 to 6, with filaments connate at base and linear basi-fixed yellow anthers with greenish umbonate tips and lateral dehiscence; pollen shed as single grains; *female flowers* subsessile, 1/10 to 1/5 inch long, with a bracteole widened elliptically at apex and about as long as the hairs; gynophore short with a few closely superposed irregular whorls of filiform hairs at base; ovary fusiform, 1-celled, with an ovule pendulous from top of cell; stigma linear; flowers mixed with pistillodes and hairs; *fruit* minute, on elongated gynophore, fusiform, with easily separable seed; *seed* narrowly ellipsoid, with orthotropous embryo.

The plant flowers from June to November.

Distribution: In Ceylon (see map), in tanks and lagoons, water courses and irrigation channels, marshy places and paddy fields in the low country (below 500 ft. elevation) chiefly in the dry zone, (less than 75 inches annual rainfall); Kilinochchi, in ponds and marshes*; near Mannar; Anuradhapura, in tanks and irrigation channels*; near Kekirava, in Epalogama tank*; Tabbova, in water courses and irrigation channels*; Minneriya, in irrigation channels and paddy fields*; Batticaloa; Tirukkovil;

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Hambu, Typha Javanica Schnizlein.


DISTRIBUTION OF HAMBU-PAN
IN CEYLON
KILINOCHCHI
MANNAR
ANURADHAPURA
KEKIRAVA
TABBOVA
MINNERIYA
500'
BATTICALOA
VENNAP'PUVA
500'
TIRUKKOVIL
75"
COLOMBO
500'
GODAKAVELA
500'
LIYANGAHATOTA
TISSAMAHARAMA
AMBALANTOTA
HUNGAMA
GALLE
AHANGAMA
MATARA
75"
MAP OF CEYLON SHOWING
500' CONTOUR.
75" RAINFALL LIMIT
FOREST

S.G.O. 31.10.40

Vennappuva, in marshy places; Colombo; and about 8 miles further north at Kandana and Ja-ela, in water courses and marshes; Godakavela; Liyangahatota; near Ridiyagama tank, in ponds and marshes; near Galle; Ahangama, in marshes*; Matara; and about a mile further north at Tudava, in paddy fields and marshes*; Hungama, in Kalametiya Kalapuva (lagoon)*; Ambalantota, in paddy fields and marshes*; Tissamaharama. (*Note*: '*' after a name signifies that specimens *in situ* in the locality were seen by the writer).

The species occurs also in the Sunda Islands, Java, Timor, the Philippines, New Guinea, the Mascarenes, Mauritius, and the Seychelles.

Economic significance: *Hambu* may spread very rapidly in irrigation channels and its chief danger is in causing silting up of the channels. The tufts of stems and leaves retard the velocity of water-flow and collect and deposit silt which causes the channel bed to rise gradually. This process is also helped by the floating roots which are very efficient collectors of silt. As the bed of the channel rises the plant spreads inwards into the channel where the depth of water has now become less than 3 feet. Thus silting goes on continuously, accompanied by increase in area occupied by the weed and in due course the plant may completely cover the channel and choke it.

The weed may appear in paddy fields but there it can be easily killed out by proper drainage or by annual average cultivation of the fields.

Hambu has some usefulness. Just before it flowers, the leaves (පඳ pan) are cut off at the base, dried in the sun and woven into large mats used for covering threshing floors when the paddy crop is threshed. The leaves are suitable for local manufacture of paper.

Its uses, however, fade into insignificance when compared with its potential danger to irrigation. *Hambu* got out of control at Minneriya, and the Department of Agriculture had to clear it at a cost of about Rs. 20,000.

The extent of the damage that may be caused can be immense. In New South Wales, in the Murrumbidgee Irrigation areas (2,000 miles of supply and drainage channel) alone, £15,000 used to be spent annually directly as a result of infestation by the very similar and closely related weed *cumbungi* (*Typha Muelleri* Rohrb., and *Typha angustifolia* L. var. *Brownii* (Kunth) Kronf.) but still the problem remained. In 1936 the Council for Scientific and Industrial Research of Australia undertook the investigation, and after various experiments has succeeded in controlling the pest by a system of cutting followed by channel patrol, at an annual cost of little over £3,000.

Propagation and dispersal.—Propagation is by seed and by vegetative means. A single plant may produce in a year up to 30 inflorescences each yielding 400,000 to 1,000,000 fruits. The fruits are very light and have a ring of hairs at the base, helping in dispersal by wind and water. The very light seeds are dispersed by the same agents. The seeds germinate on bare ground bordering the water and the plants spread upstream and downstream and in other directions by their long stolons until checked by the depth of water (about 3 feet) on the water side and lack of water on the land side. The plant is propagated vegetatively by pieces of rhizome and stolon becoming detached owing to trampling by animals, or by force of water current during floods, or other causes and carried by the current to new localities.

Methods of control.—After cutting off and burning all flower and seed spikes, removing the plant with its entire system of underground rhizomes and leaving on high land to dry is the most satisfactory method. Where the infestation is severe and the area involved is large a cheaper method can be employed for destroying the plants growing in water: the aerial stems and leaves are cut off at ground level under water at intervals of about 4 weeks, thus preventing the underground rhizomes from obtaining sufficient oxygen; insufficiency of oxygen causes the rhizomes to ferment and rot. The plants at or above water level have to be removed with the rhizomes as their roots can obtain oxygen from the soil atmosphere above the water table.

The work in Australia in controlling *cumbungi* is of especial interest to us. Chemical treatment was found to be ineffective or uneconomic. A system of cutting followed by channel patrol has been very successful. "*Cumbungi* was cut at ground level and below water at intervals varying from one to eight weeks, the first cutting being carried out at flowering time. It was found that only plants at, or above, the water's edge survived frequent cutting, and that the frequency of cutting necessary depended on the depth of water in the channel. Thus in a channel of more than 15 inches depth it was found that 96 per cent. of the original population was killed with six cuttings at six-weekly intervals, and in a drain with a fluctuating water depth not exceeding 15 inches six cuttings at four-weekly intervals killed 88 per cent. of the plants. It is an interesting point that the population decreases almost by geometric progression, so that the work involved in each succeeding cutting is greatly decreased. Cutting was carried out with short bladed scythes or by means of a special horse drawn cutter constructed by the Commission." . . . . "By maintaining the water level as high as possible in supply channels, the number of cuttings necessary was kept at a minimum.

"At this point the channels are placed under patrol. In 1937 it was considered that 20 miles of supply and 20 miles of drainage channel would provide as much as one man could perform on a fortnightly patrol. Since then this length has increased and each patrolman in the Murrumbidgee Irrigation areas looks after 67 miles of drainage and supply channel. A horse and sulky is used for transport.

"The first duty of the patrolman is to remove the few plants remaining at the water's edge. This is usually done by means of a hoe or mattock, and during the first season it is necessary to inspect the channels fortnightly. During December and January, it is necessary to prevent seedling infestation in drains. In his own section a patrolman soon recognizes the low spots in drains where pools form and seedling infestation is liable to occur. The seedlings are removed with rakes before their roots obtain a firm foothold in the silt . . . .

"In addition to preventing reinfestation by *cumbungi*, each man removes small obstructions from the channels such as the silt bars occuring at farmers' outfalls into the drains . . . .

"The channel attendant superintending the patrolmen makes regular inspections of cleaned channels and enters into a field note book the work done in maintaining the channel and the efficiency of the channel. These notes are entered on indexed folio cards for quick reference, and at any moment the history of that channel may be obtained. The field notes are accepted in law as evidence of the work in maintaining the efficiency of the channel.

"By continuing the cycle of cutting and bringing channels under patrol during the October-March period each year since 1937, it has been possible to clear completely of *cumbungi* the worst infested 900 miles of the 2,000 miles of supply and drainage channel in the Murrumbidgee Irrigation areas. This length of channel is now being patrolled by 13 men at a cost of little more than £3,000 per annum. But the difference between this figure and the £15,000 per annum does not represent the total saving, for to this must be added the fact that the channels are now permanent assets and the water distribution and drainage system is more efficient." (R. W. Prunster, in the *Journal of the Council for Scientific and Industrial Research*, Volume 13. No. 1, February, 1940).

As stated earlier, the bare soil by newly opened channels forms an ideal habitat for plants and a succession of natural vegetation sets in. This succession should be controlled to prevent the bare area from becoming a centre for dissemination of undesirable weeds by seed wind-blown or water-bourne to cultivated areas supplied with the irrigation water. It can be

controlled by growing on the channel bunds and banks a cover sufficiently thick to prevent seeds of *hambu* and other weeds from reaching the soil and finding a suitable place for germination.

Two cover plants well suited for the purpose are Kikuyu grass and *Paspalum dilatatum*. These plants have the further advantages of being (1) good soil binders and very efficient in preventing soil erosion, (2) excellent fodder and pasture plants, and (3) easily eradicable when not required. Kikuyu grass, *Pennisetum clandestinum* Hochst., (Plate III., fig. 4) (see this journal, vol. LXXXII., p. 273, May, 1934) is established by dibbling in cuttings about 3 feet by 3 feet apart. It is a creeping, perennial, quick-growing grass rooting at nodes. *Paspalum dilatatum* Poir. (Plate III., fig. 3) (see *ibid* p. 272) is grown from seed sown at 10 lb. to the acre, or by dibbling in tillers 1 foot by 1 foot apart. It is a tufted, erect, perennial grass which tillers profusely to form a dense growth.

As a further precaution against reinfestation or new infestation irrigation channels and other habitats of *hambu* should be kept under continual observation.