Some observations on *Lindernia intrepidus* (Dinter) Oerm. (= *Chamaegigas intrepidus* Dinter)

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(18 Figures)

*Lindernia intrepidus* is a small water-plant belonging to the family Scrophulariaceae. To date it has been found only in the Otjiwarongo, Omaruru, Karibib and Okahandja areas and then usually in rock pools, i.e. hollows in the rock that become filled with water in the rainy season. The amazing thing about these plants, first noted by Dinter (1), is their ability to withstand the high temperatures that must develop in these rock pools during the day.

In March 1968 plants collected at Ozombimbambo OM 85 and Neikhoes KAR 74 during 1967 were planted in the Herbarium, Windhoek. (OM & KAR is the same type of reference as used in “Prodromus einer Flora von Südwestafrika”. 85 and 74 are the registered farm numbers.)

The plants had been completely dried and were ready for mounting. Soil collected with the plants was placed in a small but thick glass-jar, giving a soil-depth of about 1.5 cm; the dry plants were then placed on top of the soil. The jar was then filled with rain-water from a tank. This artificial pool was then placed in a warm sunny position at a west-facing window where fairly high temperatures developed during hot days.

When the pool was first started in March it was noticed that the plants from the two collections had been at different stages of development when collected. Those from Neikhoes were at an advanced stage since they had already had a number of floating leaves present when collected and bloomed much sooner than those from Ozombimbambo which had no floating leaves at all and were thus at a much earlier stage of development. After being in the water for some time the basal leaves of both lots of plants became green and turgid. These plants were allowed to grow until the cold weather set in and then the pond was allowed to dry up and remained so for the cold months. (May until October).
Figure 1: Showing the new season's growth after the winter. The previous season's growth "a" is brown and the roots are shrivelled. "b" is the new growth with bright green leaves and shiny white roots. (All below water level). — Figure 2: The two large outer floating leaves still slightly appressed to each other, near the surface of the water. A prominent nerve is visible on the lower surface of the leaves. A number of basal leaves are present. — Figure 3: Lower view of the immature dorsal anthers showing large pollen sacs still closed. — Figure 4: Upper view of immature dorsal anthers. — Figure 5: Upper view of the mature anterior anthers showing close connivence of anthers. — Figure 6: Showing the widely divergent open pollen sacs of the mature anterior anthers. All the pollen has been removed. — Figure 7: Open pollen sacs of the mature dorsal anthers with a few pollen grains.
On the 3rd October 1968 the pond was again filled up with rainwater. This water was fairly cold since it was 8.00 a.m. and it had been taken from the tank outside; it was also a chilly morning. An hour and a half after the jar was filled with water the first sign of green was visible. It appears that the green was due to young leaves that had developed next to the old brown skeletons of the previous year's basal leaves. (In March the old basal leaves already present had become green). After four days the first floating leaves were observed; these took 32.5 hours to reach the top of the water, the water depth above the base of the plant being 6.5 cm. Temperature appears to play an important part in the life of *Lindernia intrepidus* since it was observed that when it was hot the floating leaves took less time to reach the top of the water though the water level remained the same. The first two rosettes of floating leaves appeared during cold overcast days and did not bear any flowers, therefore not all floating leaf rosettes bear flowers.

**DESCRIPTION**

**Leaves:** Two different types of leaves develop, namely basal leaves and rosettes of floating leaves (figs. 1, 2, 10, 11). The basal are submerged and bifurcate; each lobe is linear-subulate, falcate, fleshy and firm. They are pale green above and white below. Upper floating leaves are in two unequal opposing pairs, supporting the two flowers; the first pair is much larger than the second pair. Both pairs are dark green with purple margins and are purple below; the stalk is filiform and its length apparently depends on the level of the water.

**Flowers:** One of the two develop successively, exerted from the leaf rosette on short pedicels which recurve in fruit. These flowers have a strong smell of honey. (See illustrations in Reference 2.)

**Calyx:** This is shorter than the corolla tube, persistent, cupshaped, five-lobed, green with purple on the edge of the lobes and at the base of the calyx (figs. 10, 11, 12).

**Corolla:** White or light mauve, with purple “guide-lines”; the intensity of the purple varies from flower to flower; bilabiate, upper lip hooded with the upper edge recurved, emarginate; lower lip much longer than the upper three-lobed, the central lobe about 5 — 7 mm long, broadened and square below and there about 5 mm wide; lateral lobes spreading outwards and about 4 mm long and 3 mm wide.

**Stamens:** 4, didymous. The anterior pair decurrent on the lower side of the tube, forming a heart-shaped cushion covered with stipitate glands at the mouth of the tube; the filaments are a light purple colour and become free above the cushion, bending up and inwards to form an arch with the anthers cohering. The dorsal stamens are inserted at the base of the tube, the filaments are a much darker purple than those of the anterior ones, free, erect, arched above with the anthers cohering close beside those of the anterior pair; locules 2, divergent but confluent at base and apex; pollen granuliform and a light yellow colour (figs. 3, 4, 5, 6, 7).
Figure 8: Gynoecium showing asymmetric gland and bicaudillary ovary, style and two-lobed stigma. — Figure 9: Transverse section of the ovary showing the one side to be well-developed and with a number of ovules. The other locule is smaller, with no ovules or only abortive ovules. — Figure 10: Looking down on the rosette of floating leaves lying on the water surface, floating on top of the water with the leaves is the persistent calyx (the fruit did not develop in this case). Just visible is the stalk of a fruit which has, due to its weight, sunk down into the water. — Figure 11: Same plant as in Fig. 10. Floating leaves with fruit showing calyx and disintegrating stigma, viewed from below. — Figure 12: Calyx and placenta after seed dispersal; note swollen sides of placenta divided by a thin "wing" where the two outer walls of the ovary join. — Figures 13 and 14: The two sides of the placenta faceon showing the thick inner region and thin wing. — Figure 15: "Boat" with a number of seeds inside. — Figure 16: Opposite number "boat" which is empty, being from a sterile locule. — Figure 17: Side views of seeds showing the large funicle. (F).
Ovary: Bilocular, unequal. It appears that the one locule does not mature i.e. is infertile and does not grow as big as the fertile side; the ovules also remain small and undeveloped; three-lobed gland lies at the base of the large fertile locule; there are many ovules per locule, attached by means of a large white funicle to the swollen axial placenta; the style is appressed to the upper side of the corolla tube and upper lip, arched downwards so that the stigma is exserted in front of the stamens; there appear to be two styles very closely appressed so that they appear as one. Style remains are persistent on the fruit. The stigma is of two broad, obtuse, papillate lobes (figs. 8, 9, 11).

Capsule: Ovoid; when ripe the outer capsule wall disintegrates at the base and the sides then curl up taking the seeds with them and forming two "boats" (figs. 15, 16) which are at first joined at the apex to each other but soon separate and float away. The pedicel with the calyx and the placenta remains; the placenta is yellow in colour, asymmetrical, very rough and around the placenta where the outer walls of the ovary join there is a thin "wing" (figs. 10, 12, 13, 15).

Seeds: Minute, about 1.5 mm long, elongate-elliptic, dark brown colour, many sided and the number of sides vary. The whole seed is very rugose (fig. 17a & b).

OBSERVATIONS: OCTOBER 1968

3rd: 8.00 a.m. Rain-water from tank, water cold and morning fairly cool.
      9.30 a.m. First green colour apparent, due to new shoots which appeared next to the old brown ones. Last season's floating leaves became turgid but nothing else. Later they were all removed to clean the pond.

4th: 8.00 a.m. Many green plants.

7th: 8.00 a.m. New floating leaves present; water depth 9 cm, floating leaves 1.3 cm and 1.8 cm

8th: 4.00 p.m. Floating leaves a. 1.3 cm, tips of outer leaves on water surface, b. 5.5 cm long, day overcast and cool. As floating leaves reached the top, the larger outer leaves gradually opened, the smaller inner ones remained closed together until the former were completely spread open.

9th: 8.00 a.m. Outer floating leaves completely open, inner floating leaves still erect. Floating leaves b. almost at the top.
      11.00 a.m. Floating leaves b. on the top and opened. A number of floating leaves made their appearance.

14th: Floating leaves now started opening before reaching the top.

15th: 8.00 a.m. Floating leaves c. 3.9 cm. Water level 8.6 cm.
      11.30 a.m. Floating leaves c. 6.3 cm.
      2.00 p.m. Floating leaves c. 6.9 cm.
18th: c. Bud very prominent. Floating leaves a. & b. no sign of buds. When the leaves first develop they are of a much lighter green than later.

28th: 8.00 a.m. a. Flowered during the weekend, dead. 
b. Opened, appears to have taken a shorter time to open. Only one flower matured.

5th: Nov. Another flower opened; two buds were present but only one opened on the 5th.

6th: Nov. Second flower from bud of 5th opened. Another floating leaf with buds, one bud being larger than the other.

Abnormalities: One rosette of floating leaves had three flowers instead of the normal one or two, while in a number no flowers developed at all. A few abnormal flowers also developed. Altogether the plants were not as healthy looking in October as in March.

The drawings illustrating this article are done to different scales.

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REFERENCES
Figure 18: Development of a seedling

A. 11th Nov. 8.30 a.m. Root-cap visible.

B. 12th Nov. 8.50 a.m. With increase in length a swollen white bulge is clearly visible some distance below the seed husk. The region between the knob and the husk is green.

C. 13th Nov. Seed husk almost transparent, a cleft is clearly visible in the region between the knob and husk. There is an increase in root length and the lower portion is thinner and more curved than the upper.

D. 14th Nov. 2.00 p.m. Seed husk almost off and completely transparent.

E. 15th Nov. 8.00 a.m. Husk off and the two cotyledons exposed and spreading apart.

F. 15th Nov. 2.00 p.m. Two side-roots have appeared at the region where the tap root becomes curved and thin.

G. 22nd Nov. 8.00 a.m. Green leaves visible lying closely appressed while the cotyledons are brown and dying.

H. 20th Dec. 8.40 a.m. Two leaves separating.