

FOSSIL NUTLETS OF THE GENUS LITHOSPERMUM

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There are in the collections of the United States National Museum some hundreds of silicified fruits collected by the late John B. Hatcher from the Loup Fork formation in 1884 which have never been identified or described. More recently similar material has been sent in from the undifferentiated Tertiary of Kit Carson County in eastern Colorado.

Among these are numerous specimens representing a new species belonging to *Lithospermum*, a genus belonging to the family Boraginaceae and not hitherto known in the fossil state. These show a wide range of variation, but after much deliberation I have concluded that the best method of treatment would be to consider all of them as varieties of a single botanical species which may be called *Lithospermum fossilium*.

The smallest and most abundant variety may be described first as:

LITHOSPERMUM FOSSILIUM RUGOSUM, new variety

Plate 1, Figures 1-10

Nutlets relatively small, averaging about 3 millimeters in length, 2 millimeters in width, and 2.5 millimeters in thickness. They are contracted upward to a distal cuspidate but rounded apex, and are asymmetrically inflated, the outside being much more convex than the inside, both the apex and hilum being nearly in the plane of the less inflated inner side. On the inside a rounded keel extends from the apex nearly or quite to the hilum. The hilum is large and circular, from 0.5 to 1 millimeter in diameter. The surface is rugose but varies from nearly smooth to an aeration of well-marked ridges. This variation in sculpture is not due to abrasion before or after fossilization, I am quite sure, since it would have been equally effective on the apical point or the delicate rim of the hilum, which is not the case.

Found in both Kansas (figs. 1-6) and Colorado (figs. 7-10).

LITHOSPERMUM FOSSILIUM GLABRUM, new variety

Plate 1, Figures 11-13

This variety is less abundant than the preceding and is known only from Kansas. In form the nutlets are asymmetrical fusiform, being always larger and relatively longer and narrower than var. *rugosum*. The apex is usually more distinctly cuspidately pointed, the keel on the inner face is less pronounced, and the base is contracted to a narrower hilum. The surface is smooth and polished. It is difficult to determine the extent to which the apex was produced, since it is so readily broken off, and it is usually impossible to detect evidence of fracturing, but there is some evidence of a small amount of elongation. Length, ranging from 3.5 to 7 millimeters. Width, ranging from 1.5 to 3.5 millimeters, and thickness ranging 1.5 to 3.5 millimeters. The seed coat as preserved is one-fourth to one-eighth of a millimeter in thickness.

Phillips County, Kans. (Figs. 11 to 13.)

LITHOSPERMUM FOSSILIUM ARISTATUM, new variety

Plate 1, Figure 14

This variety is rarer than either of the preceding, probably because the seeds are much more fragile. I judge this conclusion to be correct, because among 20 specimens only the one figured has the apical spine preserved for any distance and nearly all have the seed coat more or less broken. This variety is more slender and elongated than either of the others and is more symmetrical in side view and nearly circular in transverse section. The base is contracted to a hilum about the size of that in var. *glabrum*. The apex is produced as an attenuating spine which may be two-thirds as long as the inflated portion. The keel, though obvious, is less elevated. The surface is smooth and polished. The size varies considerably. The dimensions, exclusive of the spine, which is so rarely preserved, range from lengths of from 5 to 10 millimeters and diameters of from 1.5 to 3 millimeters. The material does not permit of a determination of the constancy or length of the spines.

Phillips County, Kans. (Fig. 14.)

This is the most remarkable of the variants of this species. I know of no instance among the existing members of the families Boraginaceae, Verbenaceae, and Labiatae where the four-parted ovary develops into four nutlets where these are crowned with anything approaching the spines of this fossil variety. That this variety is related to the others is clear by the similarity between it and the shorter pointed variety *glabrum*, with which it is associated.

The genus *Lithospermum* comprises about two score existing species of annual or perennial herbs, widely scattered in prevailing dry soil habitats, mostly in the Northern Hemisphere, but sparingly represented in South America and Africa. The four-parted ovary develops into four or fewer hard nutlets of rather characteristic shape and with smooth and polished or wrinkled and pitted bony coats.

I have reproduced nutlets of several recent species for comparison with the fossils. The fossil variety *rugosum* is, in both size and form, much like the nutlets of the existing *Lithospermum linearifolium* Goldie, shown in side and inside view in Figures 15 and 16. This is a wide-ranging North American form found in dry situations from Manitoba to British Columbia and southward to Illinois, Texas, and Arizona. The species *L. arvense* Linnaeus has a similarly roughened surface.

The fossil var. *glabrum* is approached by a considerable number of existing species with hard, smooth surfaces. Of these I reproduce two, namely, *L. ruderale* and *L. pilosum*. (Figs. 17, 18, 19.) Both approach *glabrum* in size and form, but differ in their greater width and larger hilum.

I have seen nothing among the modern forms which closely resembles the fossil var. *aristatum*. Other species than those reproduced would serve equally well for comparison and illustration, but I have not been able to see fruits of all of the species.

EXPLANATION OF PLATE

- FIGS. 1-10. *Lithospermum fossilium rugosum*, new species.
 1-6. Phillips County, Kans.
 7-10. Kit Carson County, Colo.
- 11-13. *Lithospermum fossilium glabrum* Berry, new species.
 Phillips County, Kans.
14. *Lithospermum fossilium aristatum* Berry, new species.
 Phillips County, Kans.
- 15, 16. *Lithospermum linearifolium* Goldie.
 15 from side.
 16 from inside.
17. *Lithospermum ruderale* Linnaeus.
 From side.
- 18, 19. *Lithospermum pilosum* Nuttall.
 18 from side.
 19 from outside.

All enlarged three times.

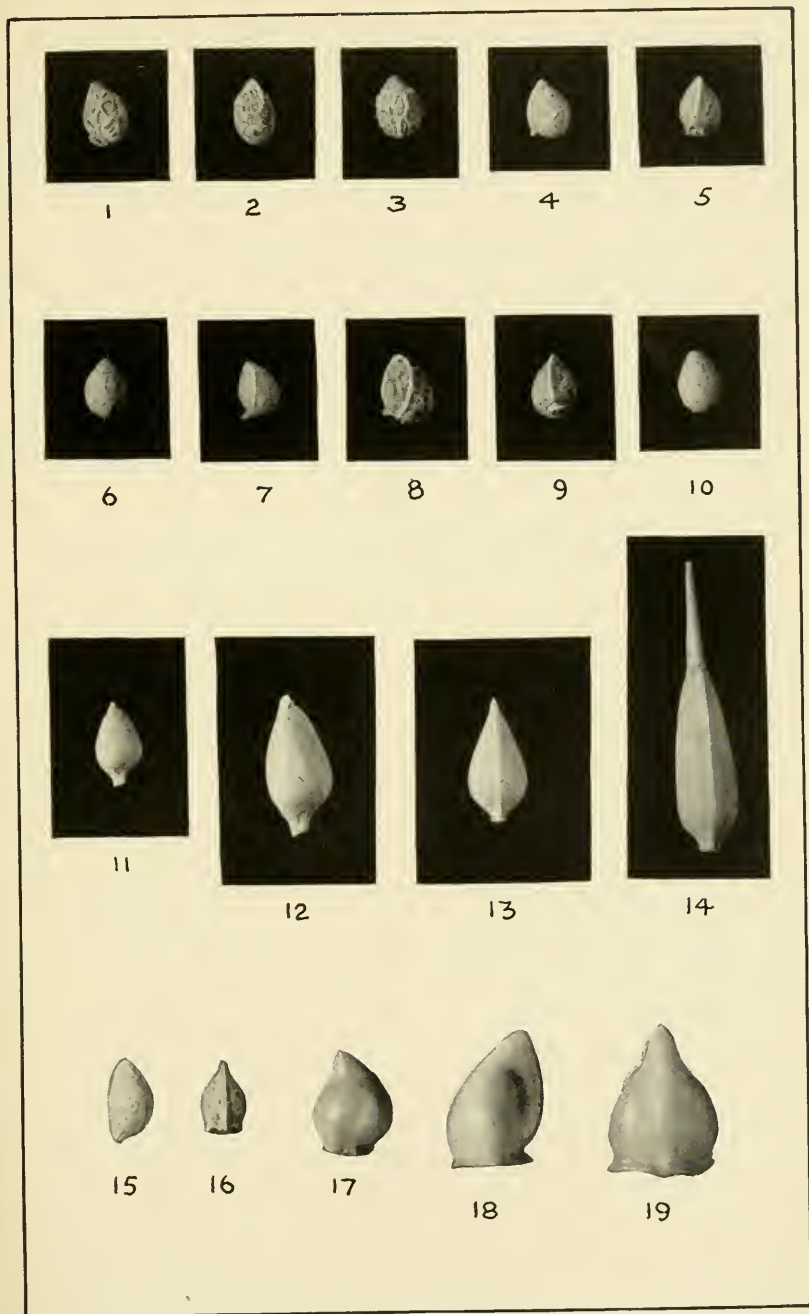


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