Marah Mysteries: Confusion over Wild Cucumber

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sidebar on **Cucurbit Pollinators and Insect Visitors** by

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How many species of "wild cucumber" grow in Oregon? This question has intrigued me for decades. I've lived and botanized in southwestern Oregon since 1970, when I bought 20 acres in the foothills southeast of Gold Hill in Jackson County (35 miles north of California on Interstate 5). Although I noticed considerable variation in leaf morphology in the *Marah* populations I encountered, I didn't give it much thought because the Oregon Flora included only one species in the gourd family (Cucurbitaceae): Oregon bigroot (*Marah oregana*).

Marah oregana leaves and male flowers. Photo by Frank Callahan.

The bigger picture

I've long been fascinated by members of the gourd family (Cucurbitaceae). While serving in Vietnam, I encountered bitter melon (*Momordica charantia*) and Vietnamese luffa or bath sponge (*Luffa aegyptiaca*), whose immature fruits are often cooked and eaten. Gourds are a large and diverse family, comprising some 98 genera and approximately 975 species. Humans are most familiar with the species that are edible vegetables/fruits, including the Old World cucumbers (*Cucumis*) and melons (*Citrullus*) and New World summer and winter squash (*Cucurbita*). The Cucurbit species in Oregon are all toxic and extremely bitter, thus without food value for humans. In fact, in 1855 California botanist Albert Kellogg chose the name Marah from the Bible, Exodus 15:22-25, which describes Moses finding a spring after three days without water in the wilderness, but the water was so bitter the people could not drink it. They named the spring marah, the Hebrew word for bitter. The bitterness is caused by the presence of terpenoid compounds called cucurbitacins, which are found in all parts of the plant. Cucurbitacin B functions as a defense against herbivores.

The mystery of the *Marah* species

In the past few years, I started collecting specimens for herbarium vouchers and found that the leaf variations were coupled with even larger differences in the fruits, flowers, and seeds. Thus, I set out to solve what I considered the mystery of the *Marah* species in southwestern Oregon. In short order my collections revealed that there are three species of *Marah* in the wooded hills near my property. Two of these, California man-root (*M. fabacea*) and Taw man-root (*M. watsonii*), were previously undocumented in Oregon and constitute range extensions into southwestern Oregon from the California Floristic Province. I suspect that the recent discovery of these populations can be explained because of the limited access to their locations. Most of the area is privately owned by armed individuals who vigorously deny access not only to their own property but also to public land that can be reached only by crossing their land. In some ways, this denial is more limiting to botanists than when David Douglas was collecting. He had only to deal with inclement weather, grizzly bears, poison oak, rugged terrain, fire, and the difficulty of preserving and transporting specimens.

In addition to my discoveries of new *Marah* species in Oregon, I also found balsam apple (*Echinocystis lobata*), which was not in the Oregon Flora. I found it in 2020 while surveying for *Asclepias incarnata* along the Snake River at the boundary between Idaho and Oregon. Although previously undetected due to its inaccessibility, this population of balsam apple is not unexpected because it is adjacent to large native populations in Idaho.

In addition to Oregon bigroot recorded in Peck (1961), four other cucurbits currently appear on the

The root of *Marah fabacea,* which I excavated from a landslide, cleaned, and placed on its side, measured 58 cm long. Photos by Frank Callahan.

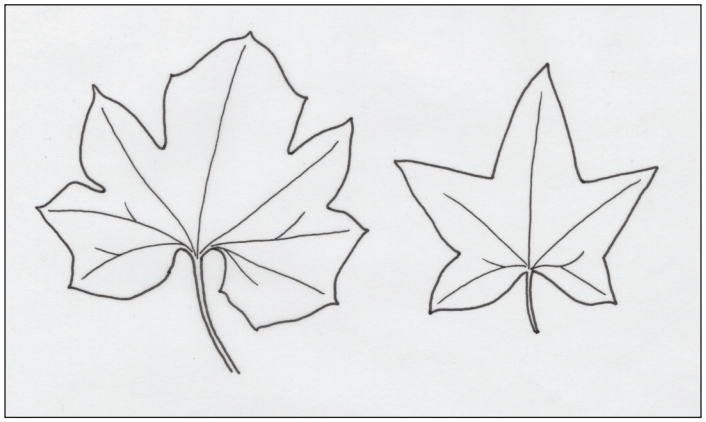
Closeup of the surface structure of the root of *Marah fabacea*. Note the embedded stone upper right corner of image.

website (Oregonflora.org), but without floristic treatment. Two *Marah* species (*M. fabacea* and *M. watsonii*) are shown as "exotic?" and two other taxa (West Indian gherkin (*Cucumis anguria*) and balsam apple (*Echinocystis lobata*)) as "not naturalized." *Cucumis anguria* was collected as a garden escape in 1918 on a vacant lot in Portland and did not persist. Both *Echinocystis* and *Marah* species are commonly called "wild cucumber." As they are both in the cucumber family, this shared common name leads to confusion.

Differences between *Marah* and *Echinocystis*

The genera *Marah* and *Echinocystis* differ primarily in their method of seed germination and their root systems. *Marah* has a tuberous root system and hypogeal[1] seed germination. In contrast, *Echinocystis* has a fibrous root system and epigeal seed germination. Since *Echinocystis* commonly grows in riparian zones with ground moisture available throughout the year, the fibrous root system serves it well. *Marah* is commonly known as bigroot or man-root because its thickened tubers grow to enormous size and can be as heavy and large as a man, weighing as much as 100 kg. *Marah*'s massive tuberous roots store water for the dry season, a useful adaptation to Mediterranean climates with long, hot, droughty summers. The tubers contain saponins and have been used as a soap or ground up and placed in water to stupefy fish.

It is not easy to view the roots of *Marah* species. Because the tubers often extend more than five feet deep in the ground, either a backhoe or excavator is needed to unearth them. Occasionally near the coast, the roots are exposed by high tides or landslides. In the very wet year of 1965, I found plants in the Coast Range of Coos County where a landslide exposed the tubers that "floated to the surface" of the moving soil.



Outline of typical leaf shapes of *Marah* and *Echinocystis*. Illustration by Cindy Roché.

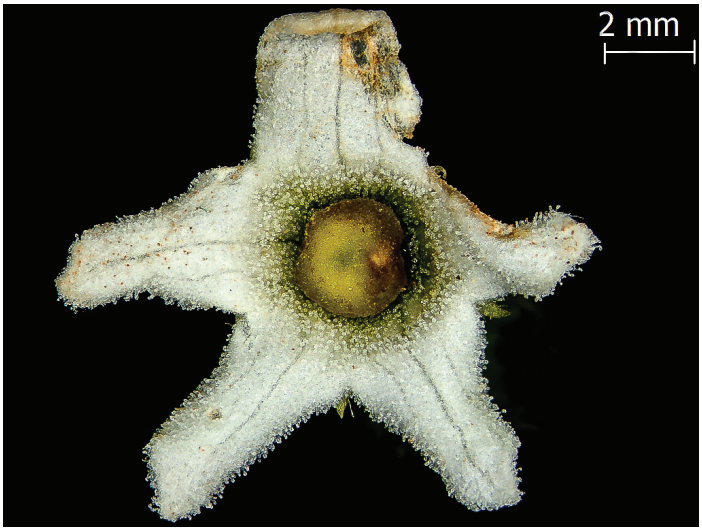
The above-ground parts of *Echinocystis lobata* resemble *Marah* species, with lobed leaves, vining stems and coiled tendrils. Since both are often called wild cucumber, casual observers often assume they are the same. However, a quick comparison of leaf morphology sets them apart: *Echinocystis* leaves have five lobes, each tapering to a single acute point, so that the leaf resembles a 5-pointed star. *Marah* leaves have lobes with multiple points, giving a more rounded appearance.

Three *Marah* species in Oregon

The three species of *Marah* in Oregon are long-lived perennial vines that trail on the ground or climb by simple or

[1]In hypogeal germination, the cotyledons remain below the soil surface during germination. In epigeal germination, the cotyledons emerge above the soil surface.

Side view of female flower and developing fruit of *Marah oregana*. Photo by Cindy Roché and Robert Korfhage.



Top view of female flower of *Marah oregana*. Photo by Cindy Roché and Robert Korfhage.

Top view of male flower of *Marah oregana*. Photo by Cindy Roché and Robert Korfhage.

branched tendrils that cling to upright vegetation. The above-ground vines die back each year to the large, deep-seated tuberous roots. Plants survive for a long time, sometimes living over 100 years. Leaves are simple with shallow lobes in Oregon bigroot and California man-root and deeply lobed in taw man-root. Plants are monoecious with male and female flowers produced on separate stalks from the same leaf axils. Staminate flowers are borne in racemes or narrow panicles, while pistillate flowers are mostly solitary. The five white petals are fused at the base, with the calyx reduced to inconspicuous lobes inserted at the sinuses of the petal lobes. The corolla is densely covered with short glandular hairs. In male flowers, the corolla is pale-green, and the stamens are fused with the anthers and twisted together in a mass to form an orange center. The female flower has an inferior ovary, from which the fruit, a capsule, develops below the flower. *Marah* produces a single crop of fruits each year in summer. Capsules generally bear prickles and are usually four-valved, splitting at the tip, where the seeds fall out. In comparison to the rigid spines on the 17 cm capsules of *Marah horridus* in the central Sierra Nevada foothills of Fresno County, prickles are soft in the species in Oregon. The dried capsules are attractive and often used in dried flower arrangements (but handle carefully!).

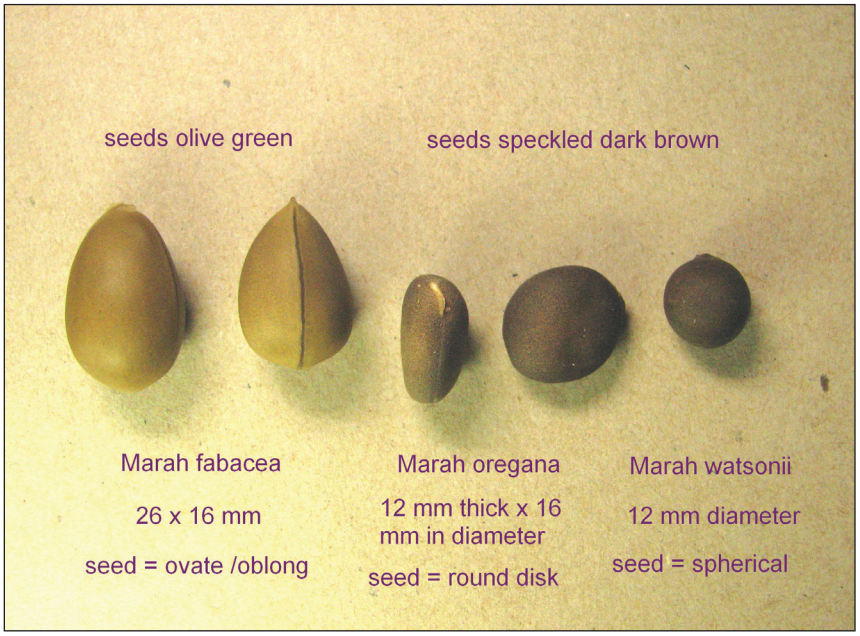
In the garden, members of Cucurbitaceae are notorious for hybridizing. Do wild species of *Marah* also hybridize? I have seen no indication of hybrids in the wild, even though Oregon bigroot and California man-root grow together and all three *Marah* species in southwestern Oregon grow within the foraging distances of potential pollinators, which makes cross-pollination possible. Stocking (1955) found no evidence of hybridization between species of *Marah* in nature or in experimental gardens.

Oregon bigroot (*Marah oregana*)

Oregon bigroot leaves are suborbicular, up to 13 cm across, with rounded to cordate bases and three to nine shallow lobes. Tubers can grow to enormous size, up to 100 kg. The corolla is cup-shaped. Seeds form in ellipsoid capsules that are up to 7.5 cm long. Capsules are densely covered with soft prickles and usually beaked at the tip. The dark brown seeds are disk shaped, 16 mm in diameter and 8 mm thick.

Of the three species found in Oregon, Oregon bigroot has the widest distribution, extending from southwestern British Columbia to the Central Valley and San Francisco Bay area in California. At the northern limits of its range in British Columbia it is known as coast manroot and is classified as endangered (COSEWIC 2009). By growing so far north, *Marah oregana* is exceptional in Cucurbitaceae, which is primarily a family of the tropics and subtropics. Success in the northern latitudes is attributed to the development of the deeply buried enormous tubers (Stocking 1955).

Beaked fruit of *Marah oregana*. Photo by Frank Callahan.



Seeds of the three *Marah* species in Oregon, showing differences in size, shape, and color. Photo by Frank Callahan.

In Oregon, this species extends eastward to Umatilla County, with isolated populations in Baker County. Although some sources indicate it as native to Idaho, the reports from Bingham County, Idaho, are in error and are actually collections of *Echinocystis lobata* (Boise State U.35513 and NY Botanical Garden Barcode 01154036).

Partly because there were no specimens of *Marah oregana* from Klamath County in Oregon herbaria, in July 2016 two colleagues (Steve Northway, Diana Wageman) and I set out to relocate Newberry's Oregon bigroot above the shoreline of Klamath Lake. Our exploration included Eagle Ridge, a peninsula in the middle of Upper Klamath Lake. We followed the narrow, single lane road all the way to its end at the northern tip of the peninsula. We found *Marah oregana* trailing in the grasses in very dry habitat in several places along this road. At the end of the road, we descended a cattle trail to the shoreline and found *Marah* plants vining among bitter cherry (*Prunus emarginata*) and Klamath plum (*P. subcordata*) that grew near a small concrete tub with flowing warm water.

Oregon bigroot's favorite habitat is Oregon white oak (*Quercus garryana*) woodland or savanna, but it is also common in the transition zone forest, where conifers mix with broadleaf trees. In southwestern Oregon, near Blackwell Hill and Gold Hill, *Marah oregana* thrives on well-drained, sandy or silt loam soils derived from granite and gabbro parent rocks. *Marah oregana* does not perform well on ultramafic soils. Other than the serpentine form of *Marah watsonii*, *Marah* species are generally not soil specific. Oregon bigroot is also adapted to a variety of other habitats, as I've found it growing on the exposed barren rocky summit of Soda Mountain in Jackson County (1856 m elevation) and near sea level at Harris Beach State Park near Brookings. It is found in riparian sites inland along the Columbia River drainage and in coastal habitats,

Marah oregana in typical open woodland habitat with *Quercus garryana* and *Cercocarpus betuloides*. Photo by Frank Callahan.

such as windblown coastal shrublands, grassy headlands, prairies and forest openings (including Douglas-fir plantations). In coastal shrublands dominated by salal (*Gaultheria shallon*), evergreen huckleberry (*Vaccinium ovatum*), and crowberry (*Empetrum nigrum*), it vines up through the shrubs and spreads out over the canopy. It is found in coastal forests with Sitka spruce (*Picea sitchensis*), Douglas-fir (*Pseudosuga menziesii*) and bigleaf maple (*Acer macrophyllum*) and on the headland and seacliffs, where its large leaves overtop the grasses. Henderson commented on his collection from the Winchuck River in 1929 that it was "very common everywhere."

Leaves and male flowers of *Marah fabacea*. Photo by Frank Callahan.

California man-root (*Marah fabacea*)

In 1859, French naturalist Charles Victor Naudin (1815-1899) described a plant grown in the botanical gardens in Paris from a large root from the San Francisco Bay area in California (Naudin 1859). He named it *Echinocystis fabacea* Naudin. Usually, the type specimen is collected from a wild population which becomes the type locality, but in this case the location of the wild population is not precisely known so the type specimen is the garden plant without a type locality.

California man-root leaves resemble those of Oregon bigroot in shape and number of lobes, but leaves of *M. fabacea* are about 2.5 cm smaller. Tuber size is also similar to that of Oregon bigroot. California man-root's corolla is rotate, not cup-shaped as in the other two species. The densely prickly capsule is up to 4 cm long, globose to slightly depressed. The name *fabacea* refers to the seed, which looks more like a seed in the pea family (Fabaceae) than one of Cucurbitaceae, which tend to be flattened. The olive-green seed is oval in both width and length, about 16 mm thick by 22 mm long, much larger than other *Marah* species.

California man-root is the most common man-root in that state. Its range extends from San Diego County north through Siskiyou County. Until I reported this species in Jackson County in the vicinity of Gold Hill it was considered a California endemic. In Oregon, this species grows at about 425 m elevation in Oregon white oak woodlands but isn't found in madrone (*Arbutus menziesii*) woodlands. It appears to be limited to silt loam soils derived from decomposed metasedimentary rock; it has not been found on clay soils. In California, it is especially abundant in the chaparral zone and also inhabits rock and scree zones in the mountains (very rarely over 1500 m elevation) and open fields in the Sacramento Valley.

Taw man-root (*Marah watsonii*)

The type specimen, originally named *Echinocystis watsonii* Cogn., was collected in the vicinity of Placerville, California. It was deposited at the California Academy of Sciences, but did not survive the San Francisco fire of 1906 (Stocking 1955). Until I found it in southwestern Oregon, taw man-root was described as a California endemic, occurring in the foothills around the north end of the Central Valley. The populations closest to Oregon are in the foothills north of Redding, a distance of about 160 miles from Gold Hill.

The most common habitats in California are rocky canyons in the lower foothills to transition zone woodlands where conifers mix with broadleaf trees; it seldom grows in open fields. Taw man-root also grows on ultramafic or serpentine influenced soils where it appears to be a distinct ecotype because the plants differ markedly in appearance from those growing on other soils. For example, on the ultramafic soils at Walker Ridge in Lake County, California, leaves are skeletal, with a glaucous, waxy lower surface. This growth form is often found in serpentine environments because it protects leaves from intense light and heat reflected from the exposed soil surfaces typical of such environments. In contrast, plants growing on non-serpentine soils in the shade of other vegetation exhibit softer, lush green leaves with more surface area.

Fruit of *Marah fabacea* opened up to expose the four seeds. Photo by Frank Callahan.

In Oregon, taw man-root grows in and around stands of California buckeye (*Aesculus californica*), yet this association with buckeye is not found in California. In Oregon California buckeye might provide shade that lowers ground temperatures and retains soil moisture. Vining into California buckeye also might afford taw man-root some protection from herbivory as the toxic leaves of buckeye are avoided by browsing animals. Normally the cucubitacins protect *Marah* foliage from grazers. However, during drought years in California the need for forage overwhelms all food preferences and cattle completely consume *Marah* plants in overgrazed fields.

Taw man-root leaves are broader than long, strongly lobed with deep sinuses to over half the width of the leaf. Overall leaf size varies with the fertility of the site. On deep fertile soil, leaves are usually 10 cm wide. Leaves on plants growing on shallow, rocky soils may be half this size. Unlike other *Marah* species, vines of taw man-root are reported to be nearly hairless, with a glaucous gray-green color (Calscape https://calscape.org/Marah-watsonii-(Taw-Man-root)?srchcr=sc57f656fa1e59c). However, this observation may be from serpentine ecotypes. Taw man-root tubers are much smaller than the other two *Marah* species, in the range of 4.5 to 7 kg. Like Oregon bigroot, the corolla is cup-shaped, not rotate as in California man-root. Capsules are about 4 cm long, round but not depressed; the surface can be smooth or sparsely spiny. The dark brown seeds are like tiny marbles, 13 mm in diameter.

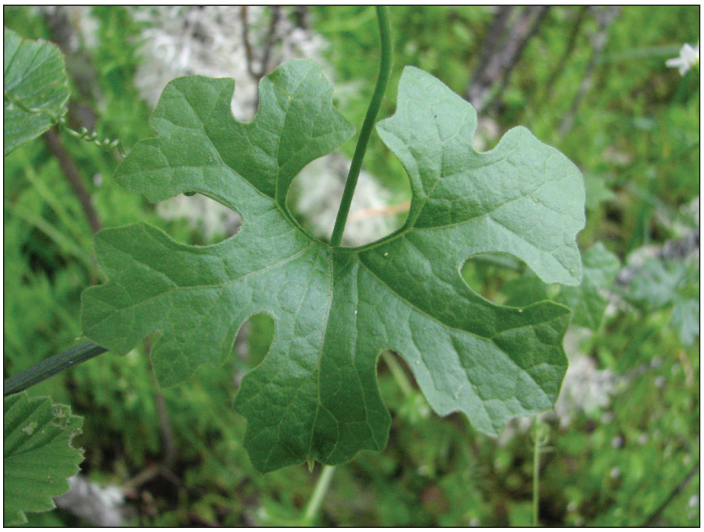
Balsam apple or wild cucumber (*Echinocystis lobata*)

Echinocystis is a monotypic genus, with the name derived from the Greek *echinos* (hedgehog) and *kystis* (bladder), referring to the spiny fruits. The type locality of *Echinocystis lobata* is in western Pennsylvania, along the Ohio River. Many references indicate that it is native across much of North America, excluding California, Nevada and a block of southeastern states (USDA PLANTS, Vascular Plants of the Pacific Northwest). It is common on the Idaho side of the Snake River and also grows in Washington and British Columbia (Hitchcock *et al.*1977). There is some historical inconsistency on whether it is native in the Pacific Northwest. For example, the *Illustrated Flora of the Pacific States* describes it as occurring in "Thickets and waste places, eastern United States and Canada westward to Montana but evidently escaping cultivation and appearing sporadically in the Willamette Valley, Oregon, and eastern Washington and western Idaho" (Abrams and Ferris 1940).

The first known collection of *Echinocystis lobata* in Oregon was by M.W. Gorman in Portland on August 30, 1905 (WS104066). Two early collections made in the riparian zone of the Link River near Klamath Falls include one by M.K. Small on August 18, 1936 (SOC 23721) and one by E.R. McLeod on September 3, 1952 (SOC 16020). In 2015 Eileen Laramore collected *Echinocystis lobata* along the Umatilla River at Gate Camp on the Oxbow Property near Hermiston (Umatilla County). In 2020, when Tom Fealy and I surveyed for *Asclepias incarnata* along the Snake River in Malheur County, we found *Echinocystis lobata* growing along a 48-km stretch of the Snake River at the Oregon/Idaho border, from the Fort Boise Wildlife Area to north of Ontario. It isn't surprising that this population in Malheur County was not discovered earlier, as all of the land here is privately owned and the only access to the riverbanks is by boat, launching at the sportsman's access points on the Snake River. In these floodplain habitats, it vines up through indigo bush (*Amorpha fruticosa*) and, as a very aggressive climber, overwhelms the tops of the bushes. We collected voucher specimens for the herbaria at Oregon State University (OSC) and Southern Oregon University (SOC).

Unlike *Marah* species, which are perennials with tuberous root systems, *Echinocystis* is an annual vine with fibrous roots, re-establishing from seed every year. Plants

Typical leaf of *Marah watsonii* on serpentine-influenced soil. Photo by Frank Callahan.



Typical leaf of *Marah watsonii* on normal soil. Photo by Frank Callahan.

trail across the ground or climb other vegetation using curling tendrils originating in the leaf axils. Leaves are usually 10 to 15 cm long and wide with five triangular lobes. Like *Marah, Echinocystis* is monoecious, with male and female flowers borne on separate stalks in the same leaf axils. The fragrant, white to pale yellow-green flowers have six narrowly lanceolate petals about one cm long that are fused at the base. The petals are densely covered with straight hairs. Male flowers are borne in upright panicles and have three stamens, in which the filaments and anthers are more or less connate. Female flowers are borne singly on a stalk at the base of the male panicles. They have an inferior ovary that develops into a sub-globose capsule, 2.5 to 5 cm long, with weak spines. Seeds are flat and ovate, 16 mm long. *Echinocystis* produces fruits from spring until early winter, making it easy to collect seeds. As in *Marah*, the seeds require cold stratification prior to germination. Seeds are readily consumed by rodents, which may aid in their dispersal.

Fruit of *Marah watsonii* showing curved spines. Photo by Frank Callahan.

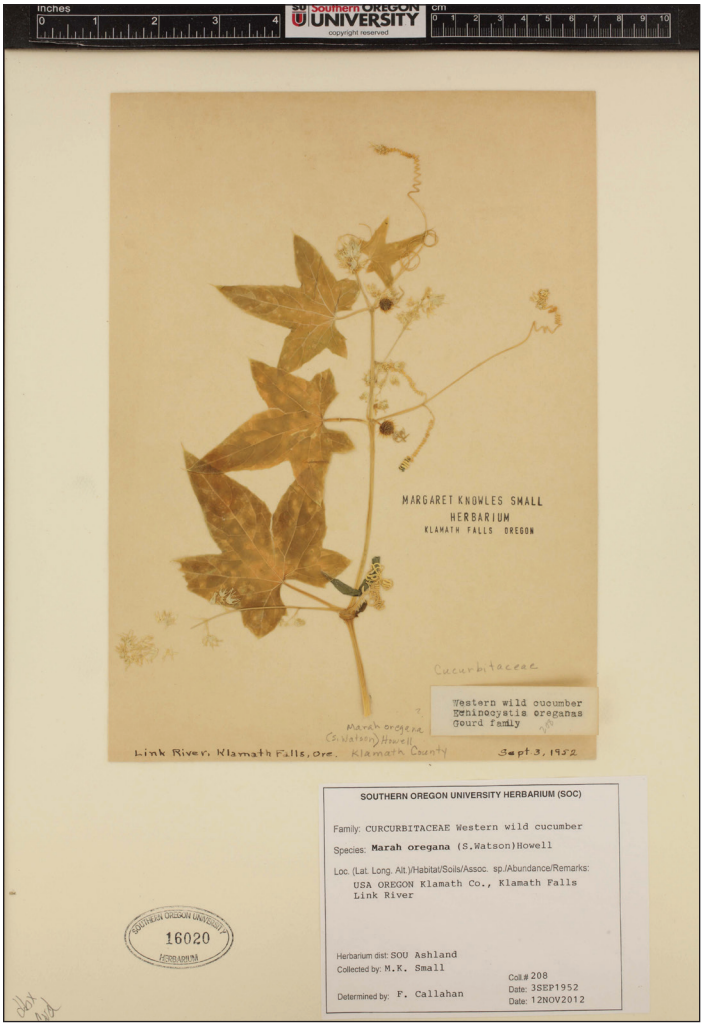
Relationships with insects for native cucurbits and garden cultivars

Marah is the native host plant for the Western spotted cucumber beetle or 12-spot beetle (*Diabrotica undecimpunctata*). This native beetle eats *Marah* leaves down to the veins, which can end growth for the season. Fortunately, *Marah* is not permanently damaged by this because it has enormous reserves in those underground tubers. These reserves allow it to endure periods when beetle populations are high and to produce seed again when beetle populations are low. Human cultivation of non-native cucurbits complicates the relationship between beetles and native plants. Gardeners blame native *Marah* for beetles in their cucurbits, but an abundance of cucumbers, squashes, and melons in gardens contributes to beetle damage in native wild cucumber populations.

Another insect, the striped cucumber beetle (*Acalymma vittatum*), feeds on both native and cultivated cucurbits. As they go from plant to plant, these beetles transmit a bacterial wilt (*Erwinia tracheiphila*). Infection occurs when adult beetles defecate on leaves where they have been feeding and bacteria enter the plant through the damaged areas. *Echinocystis* is susceptible to bacterial wilt. When cultivated and wild cucumbers grow in proximity to each other, it doesn't bode well for either one when it comes to diseases.

Never Stop Discovering!

Solving the mystery of odd-looking wild cucumbers in Oregon revealed three species that had not been included in the *Flora of Oregon*. I'm sure that this is not the last remaining discovery of unreported species in Oregon, so if you see something that looks unusual or doesn't key properly in the *Flora*, pursue it. You might be making a new discovery.



Herbarium sheet of *Echinocystis lobata* collected by Margaret Knowles Small in Klamath County in 1952, misidentified for decades as *Marah oregana*.

Cucurbit Pollinators and Insect Visitors

Lincoln R. Best

Bumble bees and host-specific pollinators called squash bees are the most frequent pollinators of large-flowered North American native species in the genus *Cucurbita*. Both also pollinate cultivars of *Cucurbita pepo* (pumpkin) and *Cucurbita foetidissima* (buffalo gourd), the bumble bees as generalists and the squash bees by adaptation to new hosts. Volunteers with the Oregon Bee Atlas (OBA), a project to inventory all the bees statewide, found the first squash bee ever recorded in Oregon, *Peponapis pruinosa*, which was collected from squash flowers in a community garden in Ashland (Best *et al*. 2019). After this discovery in 2018, the OBA directed surveyors to look for squash bees only in large-flowered squashes and pumpkins, because cucumbers are too small to accommodate the squash bees (OSU Extension 2020). This squash bee coevolved with large-flowered native cucurbits in the American Southwest so the two life cycles are perfectly aligned: bee feeding habits (collecting pollen and nectar) are adapted to the morphology and phenology (timing of flowering) of cucurbits. Early in the morning, squash flowers open and offer prodigious quantities of sugary nectar to attract the bees. In the male flowers, the bee is passively dusted with pollen, which it transfers to the next female flower that it visits. Squashes, pumpkins, and gourds are the sole pollen hosts for the females. During the first few hours after sunrise male bees dart between flowers searching for mates; by noon they are fast asleep in the withered flowers.

Since cucumber flowers are too small for *Peponapsis pruinosa*, flowers of native *Marah* and *Echinocystis* would also be too small. Pollination ecology of native cucurbit species has not been studied in Oregon, but information on bees that visit *Marah oregana* flowers has been documented by the OBA, which is part of the Oregon Bee Project. Volunteers collected 28 bee specimens from *Marah oregana* in the Willamette Valley in 2018 and 2019 (Best *et al*. 2021, 2022). Bee visitors to *Marah* included seven genera of native bees, mostly small carpenter bees in the genus *Ceratina*. In 2022, bee visitors included the small carpenter bees (*Ceratina*), mining bees (*Andrena*), mason bees (*Osmia* and *Protosmia*), a small sweat bee (*Lasioglossum*), cuckoo bee (*Nomada*), long-horned bee (*Eucera*) and a honeybee (*Apis*).

These visitation records do not necessarily indicate that these insects pollinate *Marah oregana*. Anecdotal reports mention that *Marah oregana* flower nectar attracts small bees in southwestern Oregon (https://www.amateuranthecologist.com/2015/05/floral-visitors.html) and that *Marah fabacea* in California is a nectar source for butterflies in The Presidio (National Park) (https://www.parksconservancy.org/park-e-ventures-article/one-cool-cucumber-marah-and-its-frightening-fruit) and for the green hairstreak butterfly (*Callophrys rubi*) in San Mateo County Parks (https://friendsofedgewood.org/california-manroot). *Ceratina* bees have also been reported as the most frequent visitors to *Marah* flowers in California (Schlising 1966). Small black ants, honeybees, and small beetles (Stocking 1955) and bumble bees, *Andrena* bees and gnats (Moldenke 1976) have also been recorded as flower visitors to *Marah* plants in California. The white flowers of *Marah* species produce nectar and remain open at night (Callahan, pers. comm.), so moths are also possible pollinators. I have observed significant numbers of owlet (Noctuid) moths associated with *Marah* vegetation; they may also visit the flowers for nectar. Andrew Moldenke, Research Professor at Oregon State University, has observed clearwing moths (Sessiids) visiting both sexes of flowers (Moldenke, pers. comm.).

Leafcutter bee (*Megachile* sp.). Photo by Lincoln R. Best, Oregon Bee Atlas.

Black-tailed bumble bee (*Bombus melanopygus*). Photo by Lincoln R. Best, Oregon Bee Atlas.

The naming game for *Echinocystis* and *Marah*

The earliest collection of Oregon bigroot in the Oregon Territory was in 1834 by Scottish botanists John Scouler, David Douglas, and William Fraser Tolmie, "On the Oregon [Columbia River] from near its mouth to Kettle Falls." British botanist Joseph Dalton Hooker (1817-1911) named this collection *Sicyos angulatus* Hook. (Fl. Bor. Am. 1:220, 1834). In 1840 John Torrey and Asa Gray (who had been Torrey's student) changed the name of Scouler's collection to *Sicyos oreganus* Torr. & A. Gray.

Confusion arose when Torrey used the name *Megarrhiza oregana* for this species in 1855 without a type specimen and later referred to the same plants as *Echinocystis*. The 1855 Pacific Railroad Survey's physician and botanist, Dr. John Strong Newberry[1] reported it "on the shores of Klamath Lake and banks of the Willamette River, Oregon Territory, in August & September in fruit" (Newberry 1857). He used the name *Megarrhiza oregana* (literally, Oregon bigroot). The first time the name *Megarrhiza oregana* appears in print is in the catalog of plants of the Expedition of the Pacific Railroad Reports, but "no character is given, or any synonym or citation of a description" (Greene 1887). Most of the plants from the 1855 expedition were sent to American botanist John Torrey (1796-1873), the leading authority on the flora of North America at the time. Torrey's name is appended as the authority for the name *Megarrhiza oregana*, indicating "that he was entertaining the thought of founding a genus upon these plants; an opinion which it is evident that he shortly afterwards relinquished" since a few years later in his report for the Wilkes Expedition[2] (1838-1842), Torrey referred to the same plants as *Echinocystis* (Greene 1887).

Meanwhile, events in California added to the confusion. American physician Albert Kellogg (1813-1887), the first resident botanist in California, collected specimens in 1854 near San Francisco that he named *Marah muricatus* Kellogg, based on gigantic fleshy roots and other differences (Kellogg 1854). Kellogg commented in his description, "The significance of the name we have chosen would be better understood by perusing Exodus XV: 22-25." His genus name is significant because his type was later determined to be *Marah oreganus*. To add yet more confusion, Sereno Watson published *A Revision of Megarrhiza* in the 1875 Proceedings of the American Academy which, rather than being a revision of an established genus, was the first characterization of it (Watson 1875). Neither Newberry's first publication of the name nor the revision had a type specimen or description.

Thus, the two type specimens for Oregon bigroot are the 1834 collection from the Columbia River somewhere between the Pacific Ocean and Kettle Falls, Washington, and the 1854 collection near San Francisco (US National Herbarium 1906).

Oregon bigroot becomes *Echinocystis* in 1878 and returns to *Marah* in 1898

In 1878 Belgian botanist Célestin Alfred Cogniaux (1841-1916) made *Marah* one of the three sections of the genus *Echinocystis*, thus it became *Echinocystis oregana* Cogn. (Mem. Cour. Ac. Belg. 28:87, 1878). Using Constantin Rafinesque's 1808 name *Micrampelis*, American Botanist Edward Lee Greene (1890) placed the *Marah* species in that genus: *Micrampelis oregana* (Torr. & Gr.) Greene, a name which apparently did not gain acceptance but lingers on as a synonym.

In his 1898 Flora of Northwest America, John Thomas Howell renamed *Echinocystis oregana* (Torr. ex S. Watson) Cogn to *Marah oreganus* (Torr. ex A. Gray) Howell. The Hebrew word for bitter came from an older Latin root, *Amarus,* also meaning bitter. In Hebrew, Mar is the masculine form and Mara is the feminine form. *Marah* species described as *Echinocystis* originally had feminine epithets but because *Marah* is feminine, the specific epithets have now been corrected to *Marah oregana* and *Marah fabacea*.

[1]See article in *Kalmiopsis* 22:10-19.
[2]See article in *Kalmiopsis* 12:16-24.

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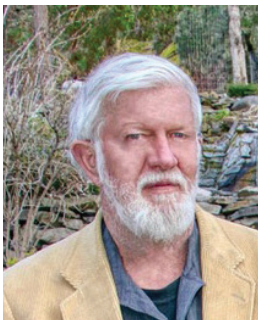

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