

Opuntia macrocentra, a variable prickly pear of the northern Chihuahuan Desert

Most articles feature rare plants that are seldom found in habitat or cultivation. We tend to extol rarity. I have been guilty of this, largely writing about unusual species or cacti in unusual places (cf. my short article on a strange *Pediocactus* in this issue). My only rationale is that, as an evolutionary biologist, exceptions often prove the rule. Articles seldom highlight charming species that are common over a large native range and/or common and easy to grow in cultivation. One such common plant is *Opuntia macrocentra* Engelm., which is native to wide swaths of the US southwest and can be cultivated unprotected outdoors in places as disparate as Phoenix, Arizona and central Ontario in Canada.

Opuntia macrocentra is commonly known as the black-spined purple prickly pear, which is a somewhat appropriate common name given that this species often has black spines and purple pads in winter. This species is sometimes commonly known as the long-spined purple prickly pear, which seems more appropriate because its spines are very long, with the longest spine per areole often being 7–12 cm (roughly 3–5 inches) long, but these spines are often reddish-brown and sometimes even white, rather than black. Plus, the species epithet *macrocentra* literally means big central spine.

Opuntia macrocentra is a northern Chihuahuan Desert native that is common in southern New Mexico, west Texas, and northern Chihuahua. It is also native to southeast Arizona and northeast Sonora, at the border of the Chihuahuan and Sonoran Deserts, but is relatively rare there (Powell and Weedin 2004; Breslin et al. 2015).

Specimens of *Opuntia macrocentra* in and around Big Bend in Brewster County, Texas are sometimes called *O. azurea* Rose (Powell and Weedin 2004; Konings and Konings 2009). Some authors consider *Opuntia azurea* to be a synonym of either *O. macrocentra* or *O. phaeacantha* Engelm. (e.g., Hunt et al. 2006), while some other authors consider them separate species but with only *O. macrocentra* native to the United States, with *O. azurea* native to Durango and Zacatecas in Mexico. (e.g. Britton and Rose 1919, Anderson 2001, Pinkava 2013). Rose's (1909) original description of *O. azurea* described, "A compact upright plant with a single trunk, 1 to 2 meters high; joints orbicular to obovate, 10 to 15 cm. in diameter, pale bluish green... Perhaps near *O. phaeacantha*, but surely very distinct", albeit without explanation for how it is distinct. However, Rose's accompanying Plate XXIV of *O. azurea* (reproduced as Fig. 181 in Britton and Rose 1919) showed a plant that is as sprawling as it is upright, with two (not one) trunks, which no doubt has contributed to confusion over this combination. The prickly pears at Big Bend with long spines and purple cladodes in winter are considered to be *Opuntia macrocentra* by Pinkava (2003) and *Opuntia violacea* Engelm. var. *macrocentra* (Engelm.) L.D. Benson by Benson (1982). Powell and Weedin (2004) rightly asserted that *O. macrocentra* has priority because "*Opuntia violacea* was not validated until 1895... by then, in 1856, Engelmann had formally named *O. macrocentra*."

Powell & Weedin's distribution maps show only *Opuntia azurea*, and not *O. macrocentra*, in Brewster County, Texas, with *O. azurea* mostly represented

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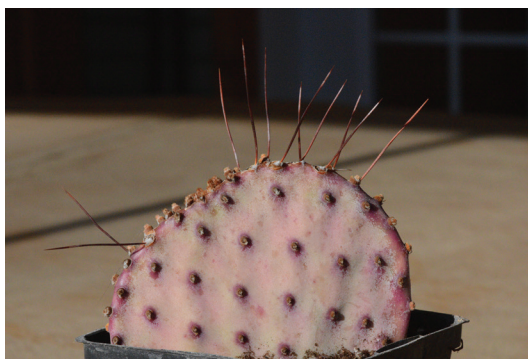
1. Prototypical conical plant of *Opuntia macrocentra*, with one or two trunks, overall plant just under 1 m height and diameter, large glaucous pads, spines only near the shoot apical meristem, and long dark-colored major spines, and no minor spines. Growing on gently sloped gravel in Doña Ana County, NM.



2. Another prototypical plant of *Opuntia macrocentra* with one trunk, just under 0.5 m tall; large purple pads; spines only near shoot apical meristem; and long dark-colored spines. Growing in a creosote bush (*Larrea tridentata*) on flat ground in Doña Ana County, NM.



3. Prototypical plant of *Opuntia macrocentra* with long black spines only on margin of pads by the shoot apical meristem, except not quite prototypical in being a sprawling plant without distinct trunks. There is variable epidermal color on this single plant, from rich purple to glaucous. Growing on a gentle slope in Brewster County, TX.



4. Cultivated cutting with 9-13 cm long reddish-brown spines, spines only near the shoot apical meristem and only along the margin of pads. Note the numerous long glochids, especially near the upper margin of the pad, which is typical of *Opuntia macrocentra*. This cutting turned from glaucous to pinkish-purple between mid-November and mid-December. Note darker pigments along the margin of pad and in a small ring surrounding each areole, which is typical for *O. macrocentra*. While not shown, the other side of the pad remained much greener. The only way I see purple epidermal color on this species in cultivation in central Ontario, Canada is by bringing cuttings indoors. Otherwise, it is too wet in summer and too snow-covered in winter. And I cannot see my cultivated plants during December and late March, when there may be less snow, because the ice is too thin on the 8.5 km of semi-frozen lake to get to the my garden. I want the ability to quickly boat or snowmobile across the lake in case our dog gets a mouthful of porcupine quills, which happens a bit too often.



5. This is the southern form of *Opuntia macrocentra*, sometimes known as *O. azurea*, in Big Bend National Park in Brewster County, Texas. This is a ground-covering form with no noticeable trunks on flat ground. These two plants (one is in background left) have white spines or at least with spines that quickly turn white after development. Nonetheless, spines are long and only near the shoot apical meristem, and with typical epidermal color for *O. macrocentra*.

by varieties *parva* A.M. Powell & Weedin and *diplo-
purpurea* A.M. Powell & Weedin. According to Powell and Weedin (2004) cladodes of *O. macrocentra* are either orbicular (circular) or taller than broad; cladodes of *O. azurea* var. *diplo-
purpurea* are either orbicular or broader than tall; and cladodes of *O. azurea* var. *parva* are obovate (egg-shaped, i.e. taller than broad) with tapered bases. According to Powell and Weedin (2004), *O. macrocentra* and *O. azurea* var. *parva* are usually upright plants with a single short trunk, whereas *O. azurea* var. *diplo-
purpurea* is a more sprawling acaulescent plant. Of the Brewster County specimens depicted herein, about half have orbicular cladodes, which is consistent with both *O. macrocentra* and *O. azurea* var. *diplo-
purpurea*, whereas the other half have cladodes that are taller than broad, which is consistent with *O. macrocentra* and *O. azurea* var. *parva*. Of the Brewster County specimens depicted herein, about half have purple pads, consistent with both *O. macrocentra* and *O. azurea* var. *diplo-
purpurea*, whereas the other half have blue-green or blue-gray pads, consistent with *O. azurea* var. *parva*. Of the Brewster County specimens depicted herein, some are upright plants with short trunks, whereas some are sprawling acaulescent plants. Powell & Weedin (2004: 135) also wrote, “Compact upright plants of var. *parva* with obovate-cuneate blue-green pads are easily distinguished, in the field and in good herbarium specimens, from var. *diplo-
purpurea* with spreading, less compact branches and orbicular, reddish-purple pads.” The problem is that pad color and pad shape vary even on a single plant: from purple to blue-green color and from obovate to orbicular shaped pads. Tellingly, Powell & Weedin (2004) also wrote, “Variety *diplo-
purpurea* is not always easy to distinguish from var. *parva*.”

If this weren't confusing enough, Pinkava (2003) in *Flora of North America* wrote that *Opuntia chisosensis* (M.S. Anthony) D.J. Ferguson of Big Bend, “is perhaps related to, or part of the *O. azurea* Rose complex”. Earlier, Ferguson (1986) wrote that *O. chisosensis* is most closely related to the *Opuntia phaeacantha* complex, in which he included *O. macrocentra*.

Opuntia macrocentra is usually tetraploid, but occasionally diploid, whereas *O. azurea* is always diploid according to Powell and Weedin (2004). But this does not help with identification in field insofar as Powell and Weedin (2004) also claimed that it is impossible to morphologically distinguish diploid from tetraploid plants of *O. macrocentra*. The closely related *Opuntia phaeacantha* is hexaploid (Pinkava 2003). I am not sure where that leaves us because it seems silly naming new cryptic species merely due to ploidy differences

(Rowley 2007; Gorelick and Olson 2011). Polyploidy occurs too readily in plants because any or almost any endopolyploid (somatic polyploid) cells can eventually undergo meiosis, and odd ploidy levels (e.g. triploid, pentaploid) are not evolutionary dead-ends because of things like triploid bridges.

For all the reasons listed above, I sheepishly disagree with Mike Powell, Jim Weedin, and Dave Ferguson by considering *Opuntia macrocentra*, *O. azurea* var. *diplo-
purpurea*, and *O. azurea* var. *parva* to all be synonymous, as did Schultz & Runyon (1930) and Benson (1982), albeit Benson called this taxon *Opuntia violacea* var. *macrocentra*. I say ‘sheepishly’ because Mike Powell and Dave Ferguson have independently been extremely generous teachers of mine when it comes to cactus taxonomy and because they have spent far more time in the field with these plants than I have.

There seems to be continuous morphological gradation between plants labeled *Opuntia macrocentra* and *O. azurea*. Even those who consider these to be two separate species agree that they are closely related, probably sister taxa. The maps in Powell & Weedin (2004) show the range of *O. macrocentra* in trans-Pecos Texas starting exactly where the range of *O. violacea* ends: *Opuntia macrocentra* is found in the north (El Paso, Hudspeth, Culberson, and Reeves Counties) while *O. azurea* is found in the south (Jeff Davis, Presidio, and Brewster Counties). “If the only way to distinguish taxa is by their geographic locales, then there is no need to assign separate names at the rank of variety or species.” (Gorelick 2020a: 52). The figures herein list the county of origin of plants, so you can substitute the name *O. azurea* for some plants, if you like.

As with most species of *Opuntia* (L.) Mill., it can sometimes be difficult discerning whether a given plant is a true form of *O. macrocentra*. Throughout the subfamily Opuntioideae, there is an incredible amount of reticulate evolution, with sexually viable interspecific hybrids (all or virtually all reproduction of *O. macrocentra* is sexual). The Opuntioideae also have lots of phenotypic plasticity. Below, I discuss some plants of what may or not be *O. macrocentra* but will start with the more prototypical cases that look unambiguously distinguishable from their congeners. The good news is that *O. macrocentra* is easier to distinguish from other *Opuntia* species than are most other species of prickly pears.

Prototypically, *Opuntia macrocentra* is a medium-sized prickly pear, to about a 0.5–1.0 m tall and diameter, sometimes with one or a few very short trunks (Figs. 1 and 2). The overall plant shape can be conical. There are thick connections between thick pads,



6. *Opuntia macrocentra* in a very arid and depauperate setting. There is one large clump of *Corynopuntia schottii* (Engelm.) F.M. Knuth to the right of *O. macrocentra* and several smaller clumps in front of *O. macrocentra*. Brewster County, TX.



7. Close-up of plants in the previous figure.



8. Spineless fruit (technically, pericarpel) and pads with spines of *Opuntia macrocentra* in Brewster County, TX.

which are thus seldom if ever detached. Pads are green or glaucous during the growing season, but typically vivid purple during the non-growing seasons, i.e. when it is either very cold or very dry. Day length may trigger these epidermal color changes. But note that color of pads can vary on a single plant (Fig. 3). Sometimes the two sides of one pad will be different colors. Purple epidermal color is darker along the margin of each

pad and darker in a small ring surrounding each areole than on the rest of each pad. Prototypical plants of *O. macrocentra* resemble small versions of their neighbour to the west, *O. santa-rita* Rose (synonym: *Opuntia chlorotica* var. *santa-rita* Griffiths & Hare). Weniger (1969) even considered plants of *O. macrocentra* from Big Bend to be *O. gosseliniana* F.A.C. Weber var. *santa-rita* (Griffith & Hare) L.D. Benson. Prototypical

plants of *O. macrocentra* have only a few spines, all of which are long, per areole and per pad. Plants with very few spines tend to have all spines along the margin of the pad (Fig. 4). Plants of *O. macrocentra* are most often found in gently sloped gravelly alluvium, such as the base of mountains and/or margins of riverine floodplains (Fig. 5). *Opuntia macrocentra* can sometimes be found in extremely arid environs (Figs. 6 and 7). By contrast with vegetative parts, flowers of *O. macrocentra* are largely indistinguishable from other prickly pears in North America, with yellow filaments and with inner tepal color that is yellow at the distal end and red at the basal/proximal end. Fruits of *O. macrocentra* are also typical of other juicy-fruited (versus dry-fruited) prickly pears, especially those with barrel-shaped spineless, but not glochid-less, fruits (Fig. 8).

Not all plants of *Opuntia macrocentra* are prototypical. How do we systematically distinguish *O. macrocentra* from other species, such as the confusing assemblage of species that include *O. phaeacantha* Engelm. (synonyms: *O. camanchica* Engelm. & J.M. Bigelow, *O. dulcis* Engelm., *O. gilvescens* Griffiths), *O. engelmannii* Salm-Dyck, *O. macrorhiza* Engelm., and *O. tortispina* Engelm. & J.M. Bigelow (synonym: *O. cymochila* Engelm. & J.M. Bigelow), or even the more readily distinguishable *O. pottsii* Salm-Dyck, all of which are sometimes sympatric with *O. macrocentra*? *Opuntia macrocentra* only has central/major spines, with no radial/minor spines. This is an unusual trait, found in only a few other North American species of *Opuntia*, e.g. *O. pinkavae* B.D. Parfitt. In contrast with *O. macrocentra*, the other aforementioned *Opuntia* species always have radial/minor spines. The photos herein labeled as *Opuntia macrocentra* all lack minor/radial spines, even those from Brewster County, Texas, plant that others might call *Opuntia azurea*. Note that the line drawing, figure 182, in Britton and Rose (1919) unambiguously shows both major/central and minor/radial spines in *Opuntia azurea*, which they thought was a taxon limited to Zacatecas and Durango. Except when spineless, *Opuntia macrocentra* usually has longer spines than other sympatric prickly pears. Except in the southern part of its range (i.e. "*O. azurea*"), *O. macrocentra* has darker colored spines than the other aforementioned *Opuntia* species. *Opuntia macrocentra* spines mostly point straight away from (orthogonal to) the pad or occasionally upwards, whereas the other aforementioned *Opuntia* species most often have deflexed spines that lay somewhat flat against the pad. *Opuntia macrocentra* pads usually have spines on at most the upper

one-third of its areoles, whereas the other taxa often have spines on the upper half or more of their areoles. *Opuntia macrocentra* is the only one of these species that ever has spines on just the outer margin/edge of pads, although this only occurs in some plants of *O. macrocentra*. Of the species listed in this paragraph, *O. macrocentra* is the only one that often forms a short trunk, with overall architecture of an inverted cone that is 0.5–1.0 m tall, but some specimens of *O. macrocentra* form spreading ground covers.

Now let me describe some of the variation in *Opuntia macrocentra* and some plants that seem intermediate between *O. macrocentra* and *O. phaeacantha*. A few specimens of *O. macrocentra* seem prototypical except that their spines are short (Fig. 9). Many specimens of *O. macrocentra* are prototypical conical plants to about 1 m tall and diameter, with medium-sized pads that are thickly connected to lower pads, with purple epidermis in the non-growing seasons, except that their spines quickly fade from either black or reddish-brown to white. This is especially true in the southern part of the range, where some plants have mostly white spines (Fig. 10), while adjacent plants have spines that seem to remain black for years (Fig. 11). Some plants of *O. macrocentra* seem prototypical except, instead of being upright conical plants, they crawl across the ground in chains of pads, much like *O. phaeacantha* (Fig. 12). The curious thing about the chain-forming specimen in Figure 12 is that a cutting, when grown in cultivation, grew much more upright, very much like a prototypical *O. macrocentra* (Fig. 13). Several specimens of *O. macrocentra* in the southern part of the range form large-diameter, short ground-covering mats of pads with white spines (Fig. 14). Figure 15 is *O. macrocentra* with the chain-like overall growth of *O. phaeacantha*, but with only a few spines per areole and spines only on the upper third of the pads, plus relatively small pads with lots of purple epidermis, especially along margins of the pads and surrounding each areole, which is typical of *O. macrocentra*. Note, though, that Figure 15 has a few minor spines, which are indicative of *O. phaeacantha*. Could this be a hybrid? Some other plants look much more like *O. phaeacantha* than *O. macrocentra*, but still with a mix of their traits. Figure 16 has purple epidermal colors and no minor spines, which is typical of *O. macrocentra*; but with spines on the top three-quarters of each pad, which is typical of *O. phaeacantha*. Also note the mix of upright and deflexed spines on Figure 16. Figure 17 has long but light-colored deflexed spines and a few minor spines, spines on only the upper



9. Looking straight down on a very short, dense clump of *Opuntia macrocentra* with exceptionally short spines. Doña Ana County, NM.



10. Prototypical plant of *Opuntia macrocentra* from Brewster County, TX, except for white spines and 2–3 spines per areole on all of the top 1/3 of the areoles per pad. This is from a fairly steep area for *O. macrocentra*. This photo may have *O. chisosensis* in the background.

third of each pad, with winter pad color that is intermediate between the purple of *O. macrocentra* and the pink of *O. phaeacantha* (Fig. 18). “Purplish specimens of [*O. phaeacantha*] can be confused with *O. macrocentra*, but [*O. phaeacantha*] is more often reddish or orangish. It apparently hybridizes with both *O. macrocentra* and *O. engelmannii* in some areas.” (Alexander n.d.). A few unambiguous specimens of *O. phaeacantha* even have the purple epidermal coloration of *O. macrocentra* in winter (Fig. 19).

Like Patrick Alexander, I would not be surprised if *O. macrocentra* hybridized with *O. phaeacantha*. *Opuntia macrocentra* is largely tetraploid ($2n=44$), albeit with a few reported diploid individuals ($2n=22$), while *O. phaeacantha* is hexaploid ($2n=66$) (Pinkava 2003; Powell & Weedon 2004). Diploids can sometimes hybridize with hexaploids to form sexually viable tetraploid progeny ($2n=44$), but such hybrids between *O. macrocentra* and *O. phaeacantha* have not been authoritatively documented. Pinkava (2003) speculated that *O. macrocentra* var. *minor* M.S. Anthony (although I am not entirely sure what that variety is, but it may be synonymous with *O. mackensenii* Rose var. *minor* (M.S. Anthony) A.M. Powell & Weedon) is a tetraploid that originated via hybridization of *O. macrocentra* var. *macrocentra* and *O. tortispina*.

Some plants of *Opuntia macrocentra* are spineless or mostly spineless. Figure 20 shows one such spineless plant that has several other interesting characteristics that seem typical for *O. macrocentra*. First, this plant shows that *O. macrocentra* often has large ephemeral photosynthetic leaves. Second, this plant shows that the thick pads of *O. macrocentra* do not start off thick, as in most other prickly pears. Instead, new pads of *O. macrocentra* start out relatively thin and grow thicker over the following few months, possibly via secondary growth. I have seen this pattern in only few other *Opuntia* species, such as in some *O. santa-rita*. Third, examining the original cutting (Fig. 21), this plant seems to show a layer of cork developing around each areole, in addition to the extra purple pigment around each areole. A layer of cork almost always forms under cactus areoles, but usually does not extend into the surrounding epidermis (Boke 1944; Jackson Burkholder personal communication). This apparent annular cork cambium formation surrounding areoles appears in many plants of *O. macrocentra*, but in few other cacti.

As previously mentioned, *Opuntia macrocentra* usually grows on very gradual slopes (Fig. 5). Not being much of a mountain climber, I am biased, but am at least willing to walk all day through deserts, even in summer, as well as drive to some unusual locations. Occasionally *O. macrocentra* surprises me by growing on



11. *Opuntia macrocentra* with jet black spines from nearby the previous figure, albeit downhill and on flatter ground.



12. This is the first of the somewhat confounding specimens that might be *Opuntia macrocentra*. The chain-like growth of pads is characteristic of the sympatric and ubiquitous (at this locale) *O. phaeacantha* in Doña Ana County, NM. Spines are long, but light colored. Epidermal color is more pink than purple, which is also indicative of *O. phaeacantha*. But, see the next figure, which is a cutting of this plant after being grown in cultivation.



13. After growing one pad cutting of the previous figure in cultivation for two years, it now looks like a typical plant of *Opuntia macrocentra*, with black spines that only grow along the margin of the pad and purple epidermal color along the margin of the youngest pad. Only the two pads in the center of the photo are of *O. macrocentra*; the two truncated pads at the bottom right are of *O. phaeacantha* that has both major and minor deflexed spines.



14. Close-up of the trunkless white-spined *Opuntia macrocentra* in the foreground of Figure 5. Brewster County, TX.



15. Another plant from Doña Ana County, NM with a combination of morphological traits of *Opuntia macrocentra* and *O. phaeacantha*. This plant has long dark-colored spines, with spines only on areoles on the upper 1/3 of pads, and purple epidermal color typical of *O. macrocentra*. But it also has major spines that are somewhat deflexed, a few minor spines, and chain-like growth, which are all typical of *O. phaeacantha*. Unambiguous forms of both species are numerous nearby. Could this be a hybrid?



16. A plant from Brewster County, TX with a combination of characters that might be a hybrid. This plant has purple epidermal colors and no minor spines, which is typical of *O. macrocentra*. But this plant has spines on the top 3/4 of each pad and a mix of erect and deflexed spines, which is typical of *O. phaeacantha*.

vertical rock faces, in the smallest of footholds (Figs. 22–24). Note how a few of these pads have short spines on the edge of pads very close to the shoot apical meristem (Fig. 24). These plants were photographed in early March at an elevation of 1500 m, a few days after snow fell, but were not purple, possibly because they were on the north-facing side of a cliff. Other than their very odd habitat and largely lacking spines, these are fairly typical looking individuals of *O. macrocentra*, which, like most cacti, show a decent amount of phenotypic plasticity. This cliff also had a few plants of *O. engelmannii*. The flatter areas near this cliff contained many very long-spined specimens of *O. phaeacantha* and some *O. engelmannii*, but seemingly no specimens of *O. macrocentra*, not even at the base of this cliff, which indicates that asexual (vegetative) reproduction is extremely rare in *O. macrocentra*. This was a magical place, in the Gila of New Mexico, where nearby were the biggest specimens I have seen of *Cochemia wrightii* (Engelm.) Doweld [the form sometimes known as *C. viridiflora* (Britton & Rose) P.B. Breslin & Majure], *Echinocereus fendleri* (Engelm.) Sencke ex Haage with very long dense spines and very large stems, and a disjunct population of *Cylindropuntia whipplei* (Engelm. & J.M. Bigelow) F.M. Knuth (Gorelick 2020b, 2021).

Many and maybe even most specimens of *Opuntia macrocentra* are sufficiently morphologically distinct that they can be readily distinguished from other prickly pears. For better or worse, though, there are still a few specimens possibly of *O. macrocentra* that are typical of the genus insofar they defy ready identification. Unlike with many species of *Opuntia* or other Opuntioideae, I have never seen good documentation of *O. macrocentra* hybridizing with other species—which may be due to lack of study—and might help explain why this species is often easy to identify. As best I can discern, both Pinkava (2003) and Alexander (n.d.) only speculated about interspecific hybrids. As shown by Figures 12 and 13, some of the morphological variation in *O. macrocentra* may be due to phenotypic plasticity, rather than hybridization, but this will require more study.

Regardless, *Opuntia macrocentra* is an attractive non-invasive species that is typical of many southern New Mexico cacti in being tolerant of both extreme heat and extreme cold. If you are looking for an upright prickly pear with purple pads and long spines, this species is worth seeing in habitat and/or possibly cultivating. Judging from the photos herein, there is enough diversity in this species to warrant growing several clones. There is even substantial morphological diversity in single individuals of *O. macrocentra*. Just look at both sides of a



17. This plant has characteristics of both *Opuntia macrocentra* and *O. phaeacantha*, but is probably an anomalous form of *O. phaeacantha*. It has spines on only the upper 1/4 to 1/3 of each pad, which are typical of *O. macrocentra*. It has deflexed major and minor spines that are typical of *O. phaeacantha*. It has epidermal color intermediate between the purple of *O. macrocentra* and the pink of *O. phaeacantha*. This plant was growing very close to the plant pictured in Figure 15 in Doña Ana County, NM.



18. Unambiguous *Opuntia phaeacantha* growing very close to the plants pictured in Figures 15 and 17. Note the very pink epidermal color, most areoles with spines, stramineous (straw-colored) deflexed major and minor spines, and chain-like growth of pads.



19. Unambiguous *Opuntia phaeacantha*, but with epidermal coloration of *O. macrocentra*, with purple at margin of pads and purple surrounding each areole. Doña Ana County, NM.



20. Spineless *Opuntia macrocentra* in cultivation, showing very long ephemeral photosynthetic leaves and very thin new pads.

pad for different epidermal colors or watch a single side of one pad quickly change color in late fall and again in spring. Definitive prototypical plants of *O. macrocentra* seem to be native along the valley of the Rio Grande only as far north as the confluence of the Rio Puerco at around 1,525 m elevation in northern Socorro County, New Mexico. Yet, all three clones of this species that I tried growing in central Ontario, Canada—all three supposedly originally from southern New Mexico—have survived winters to around -30°C . These three specimens of *O. macrocentra* are some of the few prickly pears that remain upright through Canadian winters. Too bad that I hardly ever see the vivid purple epidermal colors in cultivation because it is too wet in summer and the plants are completely snow-covered in winter. This is always a good excuse to go photograph plants in the field or bring a cutting or two indoors for winter (Fig. 4). Wendell Berry and Norman Wirzba (2002) were on to something with the phrase, “the art of the commonplace”.

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21. This is the pad from which the previous figure originated. Note the long glochids, especially near the upper margin of the pad, which is typical of *Opuntia macrocentra*. Note what looks like an annular ring of cork formation surrounding many areoles, in addition to the darker pigment surrounding each areole. I have seen this apparent cork on several specimens of *O. macrocentra*, but have never sectioned the epidermis to ascertain whether this is truly periderm formed by a cork cambium.



22. Two plants of *Opuntia macrocentra* on a vertical cliff face at sunset in Grant County, NM.



23. Same two (actually, now three) plants as the previous figure, but with less dramatic lighting in order to better see the plants.

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24. A different plant of *Opuntia macrocentra* on the same vertical cliff face. This plant has three pads that have grown a few short light-colored spines, with all spines on the margin of the pad, which are all near the shoot apical meristem. Especially see the pad that is second from the upper right. This photo was taken at the end of winter (10 March) in northern Grant County, so the spines may have initially been black or brownish-red but faded in color over the intervening months or years.