CLE DES SARCODONS

Trial field key to **SARCODON** in the Pacific Northwest

Prepared for the Pacific Northwest Key Council

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Revision Ian Gibson 2007

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INTRODUCTION

Material for this key has been adapted from "Pileate Hydnaceae of the Puget Sound Area. II. Brown-Spored Genera: *Hydnum*" by D. Hall and D.E. Stuntz, published in *Mycologia* Vol. 64, 1972; *How to Know the Non-Gilled Fleshy Fungi* by Helen V. and Alexander H. Smith; "New or Little Known North American Stipitate Hydnums" and *The Stipitate Hydnums of Nova Scotia*, both by Kenneth A. Harrison.

Sarcodon is a genus in the family Bankeraceae, most members of which have spines or downward hanging teeth as the spore-bearing surface. Sarcodons are stipitate (with stems), fleshy, brittle, brown-spored, and often large (10-30 cm). Hydnellums are also brown-spored but have tough, fibrous flesh drying hard and woody; they are usually zonate and often smaller. Since Sarcodons are tasteless to very bitter, they are not often collected for food, unlike *Hydnum repandum* and *Hydnum umbilicatum*.

The important features to observe in the field are CAP color and surface texture; STEM color and shape, including the base; FLESH color and color changes on cutting; SPINE color and length; staining reactions to injury on any part of the fruitbody; and ODOR and TASTE.

NOTE ON REVISION

The names in *Hydnum* were changed to *Sarcodon*, and *Hydnum crassum* synonymised with *Sarcodon versipellis*. Several additional references produced some changes to leads, especially "Preliminary keys to the terrestrial stipitate hydnums of North America", by Kenneth A. Harrison and D.W. Grund, Mycotaxon 28(2): 419-426. 1987. The descriptions were expanded somewhat so that the same information was available for different species. Spore sizes and the presence or absence of clamp connections were added.

KEY TO SPECIES

1a Cap and/or stem showing tones of blue or violet, in some cases only when cut……...2

1b Cap and/or stem showing tones of red, vinaceous, or brown, but not blue or violet…….....7

2a Fruitbody and flesh entirely violet.....***Sarcodon fuscoindicus***

CAP to 9 cm broad, blackish purple to blackish brown, cracked. **SPINES** 0.2-0.6(1.5) cm long, violet to lavender with pale lilac tips, decurrent far down stem. **STEM** violet. **ODOR** and **TASTE** mild to somewhat farinaceous or cinnamon-like. **MICROSTRUCTURES** spores 5-6.5 x 4.5-5 um, broadly elliptic, nearly round, tuberculate with 8-10 truncated or rounded tubercles showing on circumference, weakly amyloid; clamps absent. **REMARKS** *S. fuscoindicus* has been called a violet *Hydnum repandum*.

Sarcodon fuscoindicus

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2b Fruitbody and flesh not entirely violet.....3

3a Cap grayish to brownish with overtones of vinaceous or violet….....4

3b Cap with violet or violet tinges only when damaged.....5

4a Cap grayish to brownish with overtones of vinaceous or violet or blue-gray; cap surface soon conspicuously cracked, becoming scaly; taste mild to occasionally peppery or farinaceous (for description see 18a)……..…….***S. rimosus***

4b Cap brownish with vinaceous tint; cap surface smooth when young, then diffracted scaly, and finally cracked-scaly when old; taste bitter to farinaceous, (for description see 10a).....***S. subincarnatus***

5a Stem base blackish or olive black, flesh tinted lavender when cut and left standing (see 9a for description).....***S. scabrosus***

5b Stem base not blackish or olive black (may be dark brown when rubbed); either flesh tinted lavender when cut or pinkish vinaceous stains on cut stem base drying vinaceous to light violaceous.....6

6a Flesh tinted lavender when cut, spines with a violet tint when cut, stem violet when bruised (see 21a for description).....***S. leucopus***

6b Flesh of stem base pinkish vinaceous when cut, and on drying the stained part vinaceous to light violaceous, no bruising reaction on teeth or stem (see 21b for description).....***S. indurescens***

7a (1b) Stem base a shade of greenish or olive, or at least dull black.....8

7b Stem base not a shade of green or olive and not dull black, may be deep brown.....11

8a Stem base dull black, olive black or dark green to bluish green, spines 0.2-1.0 cm long.....9

8b Stem base another color (including grayish green), spines short (3-5 mm).....10

9a Cap light brown becoming chestnut brown, sometimes with vinaceous or violaceous shades; teeth not as fine as following sp.; taste very bitter to mild but bitterness slower than in following sp.; in coniferous woods; (spores 5.8-7.5 um long).....***Sarcodon scabrosus***

CAP 4-12 cm broad, reddish brown to brown, sometimes with vinaceous tints, smooth when young with scales more prominent and darker on aging; flesh tinted lavender when cut and left standing. **SPINES** 0.2-1.0 cm long, brown, with paler tips, fine, often some long (1 cm) but interspersed with spines about half their length. **STEM** pale pinkish brown becoming darker brown, toward the base dull black, olive black, dark green, or dark bluish green, base truncate, not swollen. **ODOR** mild to farinaceous or smoky. **TASTE** mild to farinaceous-bitter (Hall & Stuntz 1972), strongly bitter and/or peppery to farinaceous (Arora 1986 referring to *S. scabrosus* group), very bitter (McKnight 1987), bitter (Harrison 1987). **MICROSTRUCTURES** spores 6-7.5 x 4-5.5 microns, elliptic to round, prominently warted, (Arora 1986), 5.8-6.5 x 5.0-5.6 microns, round to elliptic, coarsely tuberculate, inamyloid, (Hall & Stuntz 1972); clamps absent. **REMARKS** cap tissue stains blue-green in KOH according to Arora (1986, referring to *S. scabrosus* group) and Phillips (1991), only a small part of flesh blue-green in KOH (Harrison 1961). *S. imbricatus* lacks the olive black base and usually lacks the reddish brown tone typical of *S. scabrosus*.

Sarcodon scabrosus

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9b Cap light brown; teeth fine, close; taste immediately extremely bitter; in deciduous woods; (spores 5-7 um long).....***Sarcodon underwoodii***

CAP 7-10 cm broad, grayish brown to brown, not changing color when bruised, with scales to 1 cm long, showing grayish orange between; flesh pallid. **SPINES** 0.3-1.0 cm long, showing similar colors to cap with paler tips. **STEM** grayish orange to deep brown, no color recorded when bruised; according to Harrison & Grund (1978) base of stem olive black, but Coker (1951) says it is deep snuff brown tapering to an abruptly white, pointed root, Phillips (1991) says stem deep dirty brown, white at base (white not prominent in illustration). Baird (1986b) says greenish black color is often hard to find or is lacking. **ODOR** slightly smoky or farinaceous in cap, farinaceous in stem, (Hall & Stuntz 1972). **TASTE** bitter in cap, farinaceous or bitter in stem, (Hall & Stuntz 1972), extremely bitter (Harrison 1978). **MICROSTRUCTURES** spores 5.0-7 x 4.5-5.1 um, elliptic to nearly round, tuberculate, inamyloid; clamps absent.

10a (8b) Cap brown with vinaceous tint, (surface black and subcutis blue-green with KOH).....***Sarcodon subincarnatus***

CAP 4-14 cm broad, vinaceous brown to blackish brown, bruising dark brown; appressed-fibrillose: smooth when young, then diffracted scaly, and finally cracking into scales when old which may become shingled on disc; flesh pallid with a tint of vinaceous, according to Hall & Stuntz (1972) flesh tinted reddish or lilac when cut, according to Harrison (1964) stem flesh 'whitish, changing to pallid with a tint of vinaceous or "olivaceous fuscous" in the base'. **SPINES** up to 0.6 cm long, whitish or vinaceous fawn, often paler at tips, bruising brown. **STEM** vinaceous brown to dull brownish or orange-brown, bruising brownish black, fibrillose, Hall & Stuntz (1972) say base is grayish green, and Harrison & Grund (1987) say base of stem not olive-black. **ODOR** farinaceous, pungent, penetrating as of chlorine or cucumber. **TASTE** bitter to farinaceous. **MICROSTRUCTURES** spores 5.5-6 x 4-5 um, nearly round to round, tubercles truncated short, 5-8 on circumference; clamps absent. **REMARKS** *S. scabrosus* has a reddish brown cap and brown spines when fresh (Hall & Stuntz 1972).

10b Cap reddish brown to brown, (surface blue-green in KOH).....***Sarcodon fennicus***

CAP 5-10 cm broad, reddish brown to brown, smooth becoming more or less scaly, russet brown with darker scales. **SPINES** 0.3-0.5 cm long, pale buff with darker brown tips. **STEM** rather long and tapering, blue-green to blackish olive or blackish at base. **ODOR** pleasant. **TASTE** intensely bitter (Arora 1986), peppery and unpleasant (Phillips 1991). **MICROSTRUCTURES** spores 5.5-6.6 x 6.8-7 um, nearly round, tuberculate, (Phillips 1991), clamps absent. **REMARKS** There are a number of problems here, which may have to do with difference senses of the species. Phillips (1991) says it is found in eastern North America, has a dark blue-green to blackish olive stem base, and the KOH does not give a green reaction. Smith et al. say widely distributed, stem base blackish olive to bluish green, and does not have the *S. scabrosus* KOH reaction where subcutis and context become blue-green. Arora (1986) says it has a blackish stem base and does not stain blue-green in KOH. McKnight (1987) says it is a European species that turns black not blue green in KOH . However, Harrison & Grund (1987) say found in western North America, the base of the stem is not olive-black, and in KOH the surface of the cap is blue-green. The 1888 Latin description in Saccardo's Syll. fung. VI: 433; IX: 208; XII: 964; XIX: 895. says "basi albo-tomentello, extus intusque subcaerulente-atrato", meaning "the base white-tomentose, exterior and interior somewhat blue-black". The presence of this species in the Pacific Northwest should be confirmed together with which of the senses is being used.

11a (7b) Cap surface developing distinctly scales 5-15 mm in size raised in part from surface12

11b Cap surface smooth (may have small appressed scales or cracks) or covered with bran-like particles…….....14

12a Scales large, imbricate (overlapping like shingles), upturned with background light buff, if red-brown then stem base not blackish.....***Sarcodon imbricatus***

Sarcodon imbricatus

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CAP 5-20 cm broad, light to dark brown or sometimes with a reddish or vinaceous tinge, center depressed on aging, often extending into stem hollow, covered with large, darker brown to blackish scales up to 1.5 cm x 1.2 cm which are irregularly truncate and upturned; flesh thick, whitish to grayish or brownish. **SPINES** 0.2-1.5 cm long, whitish becoming browner (yellow-brown, gray-brown, purple-brown), no bruising reaction. **STEM** whitish when young becoming some shade of brown, velvety. **ODOR** mild or weakly spicy or slightly iodized, sometimes horse-like, when dry somewhat smoky or chocolate-like. **TASTE** mild to bitter. **MICROSTRUCTURES** spores 6-8 x 5-7 um, nearly round, angular-nodular or shaped like a Maltese cross in outline, inamyloid; clamp connections present. **REMARKS** *Sarcodon scabrosus* has olive black stem base and typically reddish brown cap color. *Sarcodon leucopus* has a smooth convex cap without free scales (may be minutely areolate or with small flat scales), spines are more delicate and crowded and somewhat paler, and stem not enlarged at base, (Coker).

12b Scales not both large and upturned, OR background in shades of vinaceous, purple, pink, or light orange (or red-brown and stem base blackish)….....13

13a Lower stem black or olive-black…….....8

13b Lower stem not blackish, may be dark brown.....20

14a (11b) Cap faintly to clearly zonate, light to dark brown, drying hard and woody.....***Sarcodon stereosarcinon***

CAP to 19 cm broad, irregular, sometimes fused, light brown or pale orange, darkening to various shades of brown, somewhat zonate, downy to bald, often cracked, dark at maturity, sometimes exuding light yellow juice; flesh firm, fibrous. **SPINES** up to 1.0 cm long, similar colors to cap, tips paler than bases. **STEM** similar colors to cap, fibrous, tough, sometimes showing reddish brown droplets at the base when young. **ODOR** none **TASTE** none to slightly farinaceous. **MICROSTRUCTURES** spores 4.5-5.3 x 3.5-4.5 um, nearly round to oblong, angular, nodulose; clamps absent. **REMARKS** This mushroom has characteristics of both *Sarcodon* and *Hydnellum* and can also illustrate the wide variation to be found in one species in response to environmental factors. Flesh is non-reactive or olivaceous in KOH. There is an almost white form.

Sarcodon stereosarcinon

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14b Cap azonate (not zonate), various colors, not hard or woody….....15

15a Cap buff to yellowish tan, orange tan, cinnamon, or vinaceous brown; odor various but not farinaceous; stems white at base; often growing in dense clusters with numerous undeveloped buttons around the base.....16

15b Cap grayish, grayish brown, reddish brown, vinaceous brown, purplish brown or dark brown; odor various and may be farinaceous; stems may or may not be white at base; less often in dense clusters with numerous buttons around the base 17

16a Odor strongly sweet, or pungent or mild; cap buff to cinnamon brown when young; cap flesh unchanging, (spores 4-5.5 x 3.5-5 um, blue-green reaction of cutis in KOH under microscope, apparent amyloid granules in cutis in Melzer's reagent) …….....***Sarcodon calvatus***

CAP 15-28 cm broad, cream buff to pale cinnamon or vinaceous brown, smooth, breaking into small pressed down scales; flesh thick. **SPINES** pallid to brown, usually with with paler tips, usually unequal in length, according to Arora for *S. calvatus* group 0.2-1.2(1.5) cm long. **STEM** colored like cap or slightly paler, base often whitish. **ODOR** var. *calvatus* mild or pungent, var. *odoratus* has strong sweet fragrance (vanilla?) like *Hydnellum suaveolens*. **TASTE** var. *calvatus* mild then slowly bitter, not farinaceous, var. *odoratus* faintly farinaceous. **MICROSTRUCTURES** spores 4-5.5 x 3.5-5 um, oblong, nodulose, nodules tuberculate; clamps present. **REMARKS** Arora (1986) says that the caps of the *S. calvatus* group stains blue-green to olive-black in KOH, and Harrison gives for this species a blue-green reaction of the epicutis under the microscope. *S. leucopus* is smaller with larger spores.

16b Odor spicy (fenugreek), medicinal, smoky, or unpleasant; cap yellowish to dull yellow-brown; cap flesh may turn yellowish green when cut, (spores 5-6 x 4-5.5 um, cutis turns brownish in KOH but soon fades, no apparent amyloid granules in cutis in Melzer's reagent).....***Sarcodon versipellis***

CAP 5-15 cm broad, cinnamon or dull yellowish brown, may be grayish brown to dark brown at disc but, becoming tinted orange-brown or reddish brown toward the margin, surface tomentose then radially fibrillose with small, appressed, brownish scales, finely or rarely coarsely cracked; whitish to grayish, cap flesh may turn yellowish green when cut. **SPINES** 0.5-1.5 cm long, whitish to orange-cinnamon when young, becoming darker brown. **STEM** brown or gray to reddish brown, narrowing downward to white mycelioid base. **ODOR** unpleasant (medicinal, spicy, or fenugreek when first collected turning smoky). **TASTE** mild to somewhat bitter with a farinaceous component, or slightly peppery. **MICROSTRUCTURES** spores 5-6 x 4-5.5 um (including nodules), nearly round to oblong, with blunt, broad nodules, inamyloid; clamps present. **REMARKS** *S. leucopus* is somewhat similar but less likely to be scaly, and has larger spores.

17a Cap grayish, gray-brown, vinaceous brown, or blackish brown; flesh may become tinged with vinaceous or lilac at least when cut, or in the stem base may become tinted olivaceous gray, (clamp connections absent).....18

17b Cap gray-brown, red-brown, yellowish brown, cinnamon, or dark brown, may develop purplish tint in center, flesh may become tinged pinkish vinaceous or lavender or purplish, at least when cut, fruitbody may dry with olive-green tint, (clamp connections present).....20

18a Cap grayish to brownish with overtones of vinaceous or violet or blue-gray; taste mild to occasionally peppery or farinaceous; strong tendency to crack in age.....***Sarcodon rimosus***

CAP 4-12 cm broad, shades of brown and grayish with vinaceous or violet tinges, soon conspicuously cracked, becoming scaly, showing grayish red in cracks on aging; flesh thick, may be tinged with vinaceous or lilac. **SPINES** 0.25-0.9 cm long, pinkish brown, bruising dark brown. **STEM** pinkish brown, hoary, base with vinaceous or violet tinge, typically worm eaten. **ODOR** mild, more rarely smoky or farinaceous. **TASTE** mild to more rarely peppery or farinaceous. **MICROSTRUCTURES** spores 5-6.5 x 4.5-5 um, nearly round, tuberculate; clamps absent.

18b Cap various colors; taste bitter to farinaceous; less tendency to crack in age.....19

19a Stem base deep brown to olive black (may be whitish at tip), flesh pallid (for description see 9b).....***S. underwoodii***

19b Stem base grayish to brown or grayish green, flesh pallid developing a vinaceous tint, when cut tinted reddish or lilac (for description see 10a).....***S. subincarnatus***

20a (17b) Flesh purplish when cut, strongly olive-green when dry; stem base enlarged, taste bitter; (spores 8-11 x 6.5-9 um).....***Sarcodon atroviridis***

CAP 8-10 cm broad, softly felted, grayish tan with darker, sometimes purplish-tinted center, margin when rubbed turning blackish with a tint of green, dries grayish to smoky olivaceous brown; flesh quickly turning to purplish drab when cut, strongly olivaceous when dried. **SPINES** up to 0.5 cm long, whitish when fresh, staining blackish brown when bruised, tips drying greenish. **STEM** grayish tan, rapidly darkening to blackish brown with handling. **ODOR** rather pleasant, aromatic-woody. **TASTE** bitter. **MICROSTRUCTURES** spores 8-11 x 6.5-9 um, irregularly oval, coarsely tuberculate; clamps abundant according to the Hall & Stuntz definition of the Stirps, although Banker described the species saying the hyphae of the trama were without clamp connections.

20b Flesh turning pinkish vinaceous when cut at least in stem base, or flesh tinted lavender overall when cut, but not strongly olive-green when dry; stem base not enlarged, taste mild to farinaceous; (spore size smaller).....21

21a Pallid flesh tinted lavender when cut; taste none or farinaceous; (spores 5.5-7.4 x 5-6.5 microns).....***Sarcodon leucopus***

CAP 5-15 cm broad, brown, smooth or furfuraceous with a slight tomentum, sometimes minutely areolate-cracked or with small closely attached scales; flesh light in color, becoming deep brown when rubbed, tinted lavender when cut. **SPINES** 0.5-1.2 cm long, pale fawn to dull reddish with pale tips, becoming reddish brown when rubbed and with a violet tint when cut. **STEM** brown, dark brown when rubbed, bruising dull violet, sometimes has whitish mycelium clinging to it when collected. **ODOR** mild to farinaceous, smoky or medicinal. **TASTE** none or farinaceous. **MICROSTRUCTURES** spores 5.5-7.4 x 5-6.5 um, nearly round, rather coarsely warted and angled, some approaching a Maltese cross in outline, inamyloid; clamps present. **REMARKS** *S. versipellis* is somewhat similar to *S. leucopus* but more likely to be scaly and has smaller spores. *S. calvatus* is larger with smaller spores. Hall & Stuntz (1972) give odor as "slightly smoky or medicinal" in the description, but "farinaceous" in the discussion and in the key.

21b Flesh turning pinkish vinaceous when cut at least in stem base, drying with a faint violaceous tint; taste none; (spores 5.5-7.0 x 4.0-5.0 um).....***Sarcodon indurescens***

CAP 8-19 cm broad, shades of brownish and grayish or sometimes tinged orange; deeply cracked, drying shiny, hard, leathery. **SPINES** 0.6-0.8 cm long, yellowish gray to drab cinnamon with lighter tips, no bruising reaction. **STEM** becomes pinkish vinaceous when cut and on drying the stained part becomes more intensely vinaceous or light violaceous.

ODOR mouldy with spicy component. **TASTE** mild. **MICROSTRUCTURES** spores 5.5-7.0 x 4.0-5.0 microns, nearly round to elliptic, coarsely angular-nodulose, inamyloid; clamps present. **REMARKS** The type was described by Hall and Stuntz from Washington, but the species not included by Harrison & Grund among species known to them from North America.

GLOSSARY

button – young fruiting body before it has opened up

farinaceous – like fresh ground meal from whole grain, especially wheat; like rancid meal

nodulose – with prominent bumps

peppery – of taste, burning the tongue, same as acrid

tuberculate – with low bumps, generally smaller than nodules, but usage may vary among authors

vinaceous – the color of red wine or red wine stains; a paler or grayish red; dull pinkish brown to dull grayish purple

REFERENCES

1. Arora, David. 1986 *Mushrooms Demystified* Second Edition. Ten Speed Press, Berkeley.
2. Baird, Richard E. 1986a. "Type studies of North American and other related taxa of stipitate hydnums: Genera *Bankera, Hydnellum, Phellodon, Sarcodon*." *Bibliotheca Mycologica* Band 103: 1-89.
3. Baird, Richard E. 1986b. "Study of the stipitate hydnums from the Southern Appalachian Mountains – Genera: *Bankera*, *Hydnellum*, *Phellodon*, *Sarcodon*." *Bibliotheca Mycologica* Band 104: 1-156.
4. Banker, H.J. 1913. "Type Studies in the Hydnaceae III. The genus *Sarcodon*." *Mycologia* **5**: 12-17.
5. Coker, William Chambers, and Alma Holland Beers. 1951. *The Stipitate Hydnums of the Eastern United States*. Chapel Hill. The University of North Carolina Press.
6. Franklin, Wilfred A. 1999. An alpha-taxonomic study of *Hydnellum* and *Sarcodon* for northern California. M.A. thesis. Humboldt State University.
7. Hall, D., D.E. Stuntz. 1972. "Pileate Hydnaceae of the Puget Sound Area. II. Brown-spored genera: *Hydnum*." *Mycologia* 64: 15-35.
8. Harrison, K.A. 1961. *The stipitate Hydnums of Nova Scotia*. Can. Dep. Agric. Publ. 1099. Ottawa. 60 pp.
9. Harrison, K.A. 1964. "New or little known North American stipitate *Hydnums*." *Can J. Bot.* 42: 1205-1233.
10. Harrison, K.A., and D.W. Grund. 1987. "Preliminary keys to the terrestrial stipitate hydnums of North America." *Mycotaxon* 28(2): 419-426.
11. Harrison, K.A., and D.W. Grund. 1987. "Differences in European and North American stipitate hydnums." *Mycotaxon* 28(2): 427-435.
12. Phillips, Roger. 1991. *Mushrooms of North America*. Little, Brown, & Co., Boston.
13. Smith, Alexander H., Smith Helen V., Weber, Nancy S. 1981. *How to Know the Non-gilled Mushrooms.* Second Edition. Wm. C. Brown Company, Dubuque, Iowa.

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