

# IN DOGGED PURSUIT OF TRUFFLES

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**T**ruffles are the underground fruiting bodies of certain ectomycorrhizal fungi (Trappe and Claridge, 2010). Fungi that fruit as truffles can be found in all of the major Divisions of the Fungi - Ascomycota, Basidiomycota, Glomeromycota, and Zygomycota - indicating that the truffle form has evolved multiple times in multiple lineages through the loss of ancestral characteristics (e.g. lamellae or pores) and the selection for drought resistance and animal dispersal (Bruns et al., 1989). Of the thousands of truffles species that exist worldwide, only a handful holds culinary interest for humans. But, for those few, human

interest can drive the price up to thousands of dollars per kilogram.

Human interest in truffles is based on the very same feature that is so intimately involved with spore dispersal by animals – the heady, pungent odor of a ripe truffle. Mice, squirrels, armadillos, meerkats, deer, bears, baboons and wallabies all seek out truffles (Trappe and Claridge, 2010). Although many people believe that truffles in Europe are harvested with the assistance of pigs, in fact most truffles worldwide are harvested by trained dogs.

For many years, scientists like Dr. Jim Trappe who have been at the forefront of truffle science (truffology?) collected

truffles for study through the use of a rake. One of the keys to success when foraging for truffles with a rake is to search for non-olfactory clues to the presence of truffles, especially fresh small animal digs in the forest floor. Sometimes it is possible to find





the terms “environmental sample,” “fungus,” and “British Columbia” produces over 700 accessions and many of those are truffles in the broad sense (e.g. false truffles such as *Rhizopogon*, *Gautieria*, *Hysterangium*). Trained truffle dogs are now providing us with actual collections of ripe truffles that are now making their way into fungal collections at the University of British Columbia (UBC) and Pacific Forestry Centre (DAVFP).

with the death of her beloved cat. Pursuing a lifelong desire to own a dog, she researched many pure and designer breeds in search of a dog that would be neither too large nor too “precious,” that would be loyal, friendly, relaxed, and up for a day in the woods yet not too prone to wandering. She hit on the puggle – part beagle, part pug – which promised the best of both breeds while avoiding or moderating the pushed-in nose problems (brachycephaly). As luck

would have it, she found a puggle breeder in Salmon Arm, her home town; with that a powerful new partnership was created.

Although Dexter, the puggle, was a pet for his first few years, serendipity set the partnership off in a new direction. Brooke was in the audience when I spoke to the Vancouver Mycological Society (VMS) about truffles, dog training, and truffle guru Dr. Jim Trappe; little did I know a seed was planted that evening that soon after would bear fruit. At the Sicamous Mushroom Festival in Salmon Arm, Brooke met Larry Evans and experienced for the first time the tantalizing aroma of a ripe truffle that Larry had brought with him. At forays of the Vancouver Mycological Society, Brooke began looking in animal digs for truffles, found a few, and got hooked on the treasure hunt.

A cancelled road trip to Arizona found Brooke and



truffles left behind by the animal by “truffling” with a rake around these digs. Truffologists these days, like Dr. Alessandra Zambonelli, sometimes use trained truffle dogs to find the truffles they study (e.g. Lancellotti et al., 2016). Many fear that raking disrupts the soil, roots, mycorrhizas and mycelium and might decrease the number of truffles fruiting over time. Whether or not this is so, the clear problem with raking for truffles is that truffles of any maturity are found. Since only mature truffles are complexly odoriferous, raked truffles often include immature truffles with poor aromas and little appeal.

Knowledge of the diversity of truffles in British Columbia (BC) had until recently been based on the occasional lucky find and the occasional incursion of truffologists from other parts of the Pacific Northwest. Two developments have changed this recently – the relatively easy availability of molecular analyses and the appearance on the scene of trained truffle dogs. DNA analysis of ectomycorrhizal root tips has contributed to the expansion of what we know about the diversity and distribution in BC of true truffle species in the genus *Tuber* (Berch and Bonito, 2016). A search through GenBank using

This article is mostly a celebration of Dexter and Brooke – the first really successful truffle dog/handler team in BC. I hope, by highlighting Dexter’s accomplishments, to encourage many more people to get themselves and their dogs into the classroom and then out into the forests of BC with their noses to the ground.

Brooke Fochuk was born and raised in the town of Salmon Arm on Shuswap Lake in the southern interior of British Columbia. When she moved to the Lower Fraser Valley, east of Vancouver, BC for college, her homesickness peaked

Dexter travelling to Oregon instead at a time when Jim Trappe happened to be speaking to the North American Truffling Society about truffles of Papua, New Guinea. At that meeting, she learned about an upcoming truffle dog training opportunity and when that training session was also cancelled, she found Charles Lefevre of New World Truffieres. Charles referred her to Kelly Slocum who is a canine scent work trainer. Kelly was keen to meet Brooke and Dexter and start them on their truffle dog training. As luck would have it, Dexter was on a strict

diet due to a skin condition at the time and Kelly had raw pork to reward good behavior, a strong motivator for Dexter. In those first few hours, it was clear to Kelly that Dexter had promise as he progressed rapidly through the early phases of training.

When Brooke and Dexter returned home, they began serious training – twenty minutes a day for 6 months. This training at home was interspersed with two more sessions with Kelly. For Brooke, the focus was “the fundamentals” - detecting the scent and communicating the presence of the scent – in a controlled, non-distracting environment. Repetition and simplicity were key to ensure that Dexter understood what was being asked of him and did not get discouraged. Motivation with a favored food reward was also an important part of the training. Over the years, I have seen Brooke reward Dexter with cheese or carrots or prime rib, whatever it takes to keep him focused, happy and wanting more.

Then, one day Brooke and Dexter were out for one of their regular walks in a neighborhood park. Out of the blue, Dexter began to display search



characteristics; they headed down a bank and neared a Douglas-fir tree under which Dexter found a small (about the size of a quarter), ripe, truffle which I was later able to confirm as *Tuber oregonense*, the winter Oregon white truffle. Their very first truffle find in British Columbia! Excitement enveloped them both. Brooke became even more determined to find truffles locally but soon became frustrated that there were no other serious truffle dog teams in BC. So, she connected with like-minded folks in Washington State to learn the attributes of productive truffle sites and apply those parameters to BC forests. According to Brooke, she had to search many promising sites in BC to find a few with culinary native truffles.

But, Brooke and Dexter have not limited themselves to culinary truffles; they have been the driving force in exploring the diversity of truffle species in BC. What astonishes me is that Dexter is able to detect truffles from the four Phyla of fungi – Ascomycota, Basidiomycota, Glomeromycota, and Zygomycota (Table 1). What odors could this diverse group of fungi have in common? Dexter steps over and around mushrooms of all types to find truffles, so it is not just some generic “fungus” smell that he detects. Now, I have smelled and enjoyed the heady aromas of the Oregon white and black truffles so I can completely understand how dogs like Dexter can find those, but have you

Phylum	Species
Ascomycota	<i>Elaphomyces granulatus</i>
	<i>Genea gardneri</i>
	<i>Hydnotrya cerebriformis</i>
	<i>Leucangium carthusianum</i>
	<i>Tube anniae</i>
	<i>Tuber beyerlei</i>
	<i>Tuber borchii</i>
	<i>Tuber gibbosum</i>
	<i>Tuber melanosporum</i>
	<i>Tuber oregonense</i>
Basidiomycota	<i>Chamonixia caespitosa</i>
	<i>Hymenogaster niveus</i>
	<i>Hymenogaster subalpinus</i>
	<i>Hysterangium setchellii</i>
	<i>Melanogaster sp.</i>
	<i>Rhizopogon hawkeriae</i>
Glomeromycota	<i>Glomus sp. nov.</i>
Zygomycota	<i>Endogone lactiflua</i>

Table 1. Examples of the truffle species found by Dexter and Brooke in southwestern British Columbia.

20" x 20" Prints of the MycoBandanna Artwork Suitable for Framing  
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ever tried to detect the odor of *Endogone lactiflua*? I have and I can tell you that, to my nose, it has no aroma at all. Aroma chemistry has been extensively studied for the commercial Mediterranean truffles, for instance Culleré et al. (2010) reported that the aroma emitted by a typical Périgord black truffle is due to at least 17 different aroma molecules. In addition, odor compounds in culinary Mediterranean truffles originate not just from the fungus but also from the bacteria associated with the truffle. But, to my knowledge, other than a 1985 thesis on the aroma volatiles of *Tuber gibbosum* (Marin, 1985), the odor profiles of our native culinary truffles and the many false truffles are virtually unknown.

Now that Mediterranean truffle orchards in BC are starting to produce truffles of *Tuber melanosporum* (Périgord black truffle), *Tuber aestivum* (summer or Burgundy truffle) and *Tuber borchii* (bianchetto truffle), Dexter has become the gold standard against which other truffle dogs are compared. But, one truffle dog, even one superdog like Dexter, cannot single-handedly work all truffle orchards, document all native truffles, and find all the native culinary truffles that are becoming known and asked for in fine restaurants. We are incredibly lucky that John Kelly and his dog Macchi, are also now on the scene. Macchi is a Lagotto Romagnolo, the breed known as the Italian truffle dog, and his motivator is play rather than food. When Macchi finds a truffle, John tosses him his special, only-used-when-truffling ball and joyous play erupts. Then, the ball goes back in the pack and the hunt continues. Macchi is young but even so is making a tremendous contribution. In January, Macchi was the first dog to find a ripe bianchetto truffle in a truffle orchard

in Abbotsford, BC. Both Dexter and Macchi went on to find many more bianchettos in that orchard that day while a third truffle dog-in-training was unable to find any. While training is clearly very important, it takes something more than just training to develop a first rate truffle dog. To me, a non-expert in canine matters, it seems to also take shared focus, dedication, hard work, enthusiasm, and desire to please each other.

Thanks to the efforts of many, truffle dog training is now available in North America in many forms – on-line, in person, from professional dog trainers, via mentoring – but critical to the development of first rate truffle dog teams is practice, practice, practice of the fundamentals until the dog and handler are both fully confident. For the truffle grower, it is particularly important that this confidence be based on demonstrated success. No truffle grower wants truffles left in the ground to rot because a trained dog team turns out not to be a competent dog team.

The Truffle Association of BC is supporting the development of best management practices and standards for truffle dog teams to help ensure that truffle growers can be confident of the abilities of truffle dog teams they hire to search their truffières. Scent detection canine handlers and their dogs can already be certified by independent certifying bodies using rigorous, double-blind testing to find such things as termites, narcotics, mold, explosives, and bed bugs. Truffle detection is fundamentally no different from finding anything else and the competence of the canine team is just as important to truffle growers as it is to police officers searching for narcotics and property owners concerned about bed bugs. Certification might provide truffle growers with a measure of assurance that if truffles are present, they will be found.

I have a five-part truffle dream for BC (you should have this same dream for your part of the world):

1. Truffle dog teams scour the province for truffles and dramatically increase what we know of the diversity and distribution of truffles.
2. Truffle dog teams enjoy being in the forest, hunting for treasures, and working together. As a side benefit,

they find truffles that contribute to science and to the table.

3. Professional truffle dog teams work with truffle growers to ensure that all cultivated truffles harvested in BC are at the peak of ripeness and build a first rate reputation for cultivated culinary BC truffles.
4. Truffle dog teams search native forest and harvest native culinary truffles at the peak of ripeness and build a first rate reputation for native culinary BC truffles.
5. Truffologists like me find truffle dog teams to work with so that, even for science, raking is no longer the go-to truffle collecting method.

### References Cited

- Berch, S.M., and G. Bonito. 2014. Cultivation of Mediterranean species of *Tuber* (Tuberaceae) in British Columbia, Canada. *Mycorrhiza* 24(6): 473-479.
- Berch, S.M., and G. Bonito. 2016. Truffle diversity (*Tuber*, Tuberaceae) in British Columbia. *Mycorrhiza* DOI 10.1007/s00572-016-0695-2.
- Bruns, T.D., R. Fogel, T.J. White, and J.D. Palmer. 1989. Accelerated evolution of a false-truffle from a mushroom ancestor. *Nature* 339: 140-142.
- Culleré, L., V. Ferreira, B. Chevret, M.E. Venturini, A.C. Sánchez-Gimeno, D. Blanco. 2010. Characterization of aroma active compounds in black truffles (*Tuber melanosporum*) and summer truffles (*Tuber aestivum*) by gas chromatography–olfactometry. *Food Chemistry* 122: 300–306.
- Lancellotti, E., P. Fantini, M. Iotti, A. Franceschini, and A. Zambonelli. 2016. *Tuber melosporum* smooth spores: an anomalous feature in the genus *Tuber*. *Mycologia* 108: 174-178.
- Marin, A.B. 1985. *An Analytical and Sensory Evaluation of the Aroma Volatiles of Tuber gibbosum*. M.Sc. thesis, Oregon State University <http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/27224/MARINANNA1985.pdf?sequence=1>
- Trappe, J.M., and A.W. Claridge. 2010. The hidden life of truffles. *Scientific American* 302: 78-84. doi:10.1038/scientificamerican0410-78.

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