

Nationalization and Globalization Trends in the Wild Mushroom Commerce of Italy with Emphasis on Porcini (*Boletus edulis* and Allied Species)¹

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Nationalization and Globalization Trends in the Wild Mushroom Commerce of Italy with Emphasis on Porcini (*Boletus edulis* and Allied Species). This paper presents an historical overview of wild mushroom commerce in Italy, with a focus on recent trends in the production of porcini (*Boletus edulis* and closely allied species). Over the past century, two major trends—nationalization and globalization—have been apparent in the wild mushroom commerce of Italy. First, a simplified national mushroom menu has emerged through processes of governmental regulation and culinary fashion, but it has come at the expense of differing, localized mushroom traditions which may suffer under the European Union's free trade principles. Second, Italy has emerged as a focal point of a global market for a small number of mushroom species—particular porcini. While the name porcini has become synonymous with Italian cuisine, and in spite of a vibrant tradition of recreational mushroom collecting in Italy, most of the porcini commercially available in Italy or exported by Italy are no longer of Italian origin. Porcini and other mushrooms now flow into Italy from all over the world—especially from China and eastern Europe—and are then often exported as “Italian porcini.” This globalization of the wild mushroom trade, while offering significant income to rural producers and processors around the globe, has other effects as well, for example, a kind of national branding as “Italian” of globally-produced products, of which porcini is one, that is in direct opposition to some of the European Union's rules for regional denominations.

Processi di Nazionalizzazione e Globalizzazione nel Commercio Italiano dei Funghi spontanei, con Particolare Riguardo ai Porcini (*Boletus edulis* e Specie Affini). Questo articolo presenta una panoramica storica sul commercio dei funghi spontanei in Italia, con particolare riguardo alle recenti tendenze nella produzione dei porcini (*Boletus edulis* e specie affini). Nello scorso secolo si sono osservate due tendenze principali—di nazionalizzazione e di globalizzazione—nel commercio dei funghi spontanei in Italia. In primo luogo si è affermata nel territorio nazionale una tradizione limitata al consumo di un numero contenuto di specie, sia per effetto di alcune normative che di mode culinarie, ma ciò è avvenuto a discapito di tradizioni locali più ricche, che potrebbero ulteriormente risentire dei principi per il libero scambio all'interno dell'Unione Europea. In secondo luogo, l'Italia si è posta in evidenza come un punto nodale per il mercato globale di alcune specie fungine, in particolare dei porcini. Nonostante quest'ultimo termine sia tradizionalmente associato alla cucina italiana, e nonostante esista in Italia una vivace e radicata tradizione nella raccolta amatoriale dei funghi, la maggior parte dei porcini ivi commercializzati (allo stato fresco, essiccati o variamente conservati) o esportati verso altri paesi non sono più di origine locale. I porcini e altre specie fungine giungono attualmente in Italia da ogni parte del mondo—in modo particolare dalla Cina e dall'Europa orientale—e sono successivamente spesso esportati come “prodotti Italiani.” Questo processo di globalizzazione del mercato dei funghi spontanei, pur offrendo un significativo introito ai raccoglitori e commercianti rurali su tutto il globo, è responsabile di altri effetti, come per l'appunto una sorta di marchio nazionale “Italiano” su alcuni prodotti di provenienza globale, come per l'appunto i porcini, cosa che contrasta con alcune delle regole dell'Unione Europea in materia di denominazioni regionali.

Key Words: Porcini, Wild mushrooms, Fresh, Dried, Brine, Trade, Italy, Globalization, Nationalization.

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Brief History of Wild Mushroom Commerce in Italy

Porcini (*Boletus edulis* and closely related species) (Fig. 1) are widely known as the premiere edible mushrooms of Italy and as essential components of Italian cuisine. This has not always been the case, however. Over the past century, a process of nationalization and cultural homogenization has resulted in porcini assuming a preeminent position in Italian gastronomy and mushroom commerce (Sitta et al. 2007).

Wild mushroom markets have flourished in Italy for centuries, but preferences and consumption patterns showed great regional variation before the 20th century. During the Roman period, several species of mushrooms were widely eaten (Buller 1914). In the 16th century, Felici (1569) characterized the spring-fruiting *Calocybe gambosa* as the “most valued and expensive fungus” in Umbria and Marches in central Italy. The same author ranked the summer and autumn mushrooms, with *Amanita caesarea* in first place, various species of *Russula* in second place, and porcini ranked only third, followed by various species of *Agaricus*, *Hydnum*, *Ramaria* and *Armillaria*. This was also

true in the Appennine mountain region (Liguria, Tuscany, and Emilia-Romagna), where Targioni Tozzetti (1777) described *Calocybe gambosa* as a “very noble fungus, worthy of the Prince’s tables.” However, both Fantoni (1779) and Angeli (1835) report that *Amanita caesarea* was considered less valuable than porcini in this region, while *Cantharellus cibarius* and puffballs (Lycoperdaceae) of considerable size were also prized. (Note: All species authorities as well as common Italian names are provided in the [Appendix](#).)

In the Kingdom of Lombardy-Venetia in northern Italy, the commerce of fresh and preserved wild mushrooms must already have been very important in the 18th century, and caused many cases of poisoning every year. In response to this problem, the first important set of rules (*Regolamento sulla vendita dei funghi*) was elaborated and promulgated by the Milan government in 1820 under the Austrian-Hungarian domination, with successive additions and modifications in 1823 and 1856. These rules were intended to organize and control the marketing of fresh and dried wild mushrooms, detailing the species which could be sold in order to avoid (or at least to reduce) the number of poisonings.



Fig. 1. “Italian” porcini originating in Yunnan, China.

Wild mushroom commerce in Rome during the 19th century is described in detail by Ottaviani (1832) and Lanzi (1889–1893), who published lists of the numerous species consumed and sold at that time. The quantities of mushrooms were already substantial in the early 19th century, with an estimated 30–40 metric tons of fresh mushrooms being sold each year in the city of Rome (Ubaldi 1990). Farneti (1892) provided an overview of mushroom commerce in late 19th century Italy, including the following observations:

- (1) Porcini represented three-quarters of the fresh mushrooms sold in the most important Italian markets (i.e., Rome, Milan, Bologna, and other cities of northern Italy).
- (2) *Amanita caesarea* was one of the most valued mushrooms in markets all over Europe.
- (3) *Armillaria mellea* and closely-related species were present in large quantities in the markets of Lombardy in northern Italy.
- (4) Wild *Agrocybe aegerita* was commercialized prominently in the markets around Naples and in Tuscany.
- (5) *Leccinum* spp. (a genus of boletes quite different from porcini) were especially popular in northern and central Italy (Lombardy, Piedmont, and Tuscany).
- (6) *Pleurotus eryngii*, *P. cornucopiae*, and *Lyophyllum fumosum* sensu lato (listed as *Tricholoma effocattellum*) were highly appreciated in Rome, as was the shelf fungus or polypore, *Polyporus corylinus*.

During the 20th century, the quantities of commercially traded wild mushrooms rose dramatically. The market of Milan alone, from 1919 onward, regularly traded more than 100 metric tons per year (Ferri 1934). The richest market in terms of species diversity was undoubtedly the one in Trento, near the base of the central Alps in northern Italy. This market developed dramatically during the second half of the 20th century (Cetto and Lazzari 1966), and more than 250 mushroom species could be observed on sale before Italian regulations instituted in 1995 limited the menu of species.

Given their worldwide reputation as “Italian” mushrooms, it is quite remarkable that porcini remained almost unknown in some parts of Italy until a few decades ago. This was especially so in southern Italy, where mushroom commerce wasn’t organized in the big vegetable markets, but was

limited instead to local exchanges between pickers and consumers of small quantities of wild mushrooms (as continues to occur, for example, in the Basilicata region of southern Italy). On the southern island of Sardinia, the main species locally harvested and sold were, until a few decades ago, *Pleurotus eryngii* sensu lato, *Agaricus* spp., and boletes other than porcini (e.g., *Leccinum corsicum*, and *L. lepidum*). In the southern region of Calabria, the “discovery” of porcini as edible mushrooms took place around 1940, thanks to an influx of migrant timber cutters and coal miners from the northern province of Liguria. Before that time, the prime edible mushrooms of the mountains of Calabria most valued by local people were *Suillus luteus* and *Lactarius deliciosus* sensu lato, while most of the porcini were not even picked! Wide-scale exploitation of Calabria’s porcini for use and sale began after World War II and reached its peak in the 1960s, when the porcini harvest became a significant source of income for the mountain villages of that region (Pipino 1972). In the coastal areas of Calabria, porcini also occurred but were likewise for a long time ignored. Instead, the most commonly sold species were *Ramaria* spp., *Lactarius tesquorum*, *Leccinum corsicum*, and *Armillaria mellea* and its close relatives (Sitta et al. 2007).

HISTORICAL TRADE IN DRIED MUSHROOMS

The commercial trade in dried porcini existed as early as the 17th century in Italy. It is well documented for the area of Borgotaro in the Apennine mountains near Parma (Bellini 1933), but was surely widespread in other areas. In the 19th century, Italian dried porcini were also exported to other European countries and even to America, mainly by Genoese firms (Bertoloni 1867; Farneti 1892). Very carefully crafted and sealed packages were used to export the dried mushrooms: cellophane bags, tin boxes of different sizes, or compressed parcels which were particularly suitable for their transport (Bellini 1933).

During the 19th century, the sale of dried mushrooms of many other species was also considerably widespread within Italy, and episodes of poisoning caused by dried mushrooms were apparently more frequent in that era than now. In response to this problem, retailers were required to have licenses, or commerce in dried mushrooms was simply forbidden. The homogenization of Italians’ food tastes (as part of the construction of a national

identity) plus the stricter health standards have combined to create the present situation, in which very few dried wild mushrooms are sold aside from porcini—so few, in fact, that the phrase *funghi secchi* (“dried mushrooms”) is almost interchangeable with the phrase *porcini secchi* (Sitta, Togni, and Zotti 2007a).

THE MOST IMPORTANT WILD MUSHROOMS CURRENTLY TRADED IN ITALY

Wild mushrooms have a remarkable importance in the Italian culinary tradition. While porcini are considered a defining part of traditional Italian cuisine and culture, a number of other species are still collected and consumed when fresh. Local mushroom dealers must pass an exam before being allowed to sell fresh wild mushrooms. This exam requires basic skills in wild mushroom identification, as well as knowledge of any special treatment required by certain species before consumption (Sitta 1997). Italian law (D.P.R. 376/1995) lists more than 60 mushroom species which can be traded commercially, while regional additions bring the overall total to around 150 species. However, articles 23–30 of the European Union treaty guarantee the free movement of goods within the EU, which is not consistent with being able to sell a mushroom species in one region but not in another. At present, Italy’s mushroom regulations are under revision, and it is likely that the regional additions will either be added to the national list (making it much longer but more inclusive) or will be eliminated entirely (thus reinforcing the trend toward a less diverse European cuisine that works against the conservation of regional traditions and idiosyncrasies). An unintended consequence of the EU articles may thus be to suppress the expression of local tradition and identity by further restricting which kinds of mushrooms are available in the markets.

Though many mushroom species are appreciated as food in Italy, only a few occur in sufficient quantity to be sold in economically significant amounts. Among these are porcini, the chanterelle (*Cantharellus cibarius* sensu lato), and the *ovolo*, *Amanita caesarea* (which is one of the most expensive mushrooms). During the springtime, *Calocybe gambosa* is still highly prized, but only in some regions (Emilia-Romagna, Tuscany). It can be very expensive (up to EUR 40/kg), about the same price as morels (*Morchella* spp.), which,

although appreciated, do not meet with the same favor that they do in France. Other species that figure prominently in the Italian gastronomic tradition include honey mushrooms (*Armillaria mellea* and close relatives), which are consumed in especially large quantities in northeastern Italy, and *Lactarius deliciosus* and its close relatives, which are widely harvested in Umbria, Tuscany, Latium, Campania, and Calabria.

Species of secondary interest because their consumption is confined to smaller geographic areas include *Agaricus* spp., *Agrocybe aegerita*, *Boletus regius*, *Suillus* spp., *Craterellus lutescens*, *C. cornucopioides*, *Hydnum repandum*, *Macrolepota procera*, *Marasmius oreades*, *Pleurotus eryngii* sensu lato, *Tricholoma portentosum*, and *T. terreum*. It should be noted that *Agaricus* spp., *Agrocybe aegerita*, and *Pleurotus eryngii* sensu lato are more often than not cultivated rather than collected from the wild, while *Suillus* spp., especially those imported from Chile, are usually sold dried, frozen, or brined rather than fresh.

Hypogeous mushrooms (truffles) are also important economically, not only because of demand by the public but also because several valuable species are collected in Italian territory. The most valued truffles are *Tuber magnatum* (the white Alba truffle), which sells in Europe for EUR 2,000–4,000 per kg (depending on size and availability) and *Tuber melanosporum* (the Norcia black truffle). Many other truffles are also sold on the Italian market, however, as well as some extralimital species (especially Asian species such as *T. himalayense* and *T. indicum*). The Asian species are not on the Italian list of approved species, but are legally commercialized in other European countries (e.g., France).

What are Porcini?

The designation porcini (singular: *porcino*) has a specific commercial meaning in addition to its vernacular use. The Italian regulations use the formula “*Boletus edulis* and related species,” which should be interpreted as including all the species of the genus *Boletus*, section *Boletus*. These boletes always form ectomycorrhizae, particularly with trees of the families Fagaceae and Pinaceae, and are relatively easy to separate as a group from the hundreds of other boletes (Boletaceae) by the following combination of shared characteristics: (1) white, unchanging context, with a characteristic, agreeable taste; (2) stipe surface (or at least

the upper portion of the stipe surface) with a more or less well-developed reticulum; and (3) white tubes and pore surface, changing with the maturation of the spores to a yellowish color, and finally becoming dark olive green.

Singer (1986) specified that the color of the pores of some species may sometimes remain “light brownish.” He recognized numerous species in section *Boletus*, including European and North African species such as *Boletus edulis*, *B. aereus*, *B. aestivalis*, *B. pinophilus*, and *B. mamorensis*, North American species such as *B. variipes* and *B. separans*, and Asian species such as *B. violaceofuscus*.

Lines of demarcation between the different species are not always clear, and it is still debated whether some taxa should be regarded as distinct species or simply as ecological or geographical forms. Although morphological variability within section *Boletus* is still not fully understood, recent molecular studies (Leonardi et al. 2005; Mello et al. 2006) confirm that the world’s porcini fall into two broad groups:

- (1) *Thermophilic* species, characterized by a dry and fragile cuticle, white flesh under the cap cuticle, intensely perfumed context, and smaller spores on average—classic examples are the European species *B. aereus* and *B. aestivalis*.
- (2) *Mesophilic* species, with less fragile cap cuticle that is lubricious when wet, colored flesh under the cap cuticle, less intense perfume, and bigger spores on average—classic examples are the European species *B. edulis* and *B. pinophilus*.

European porcini consist mainly of the four species cited above: *B. edulis*, *B. pinophilus*, *B. aereus*, and *B. aestivalis*. In mountainous or cool areas (e.g., Poland), there are significant quantities of *B. edulis*, but they are often not very fragrant. As one moves north, *B. pinophilus* becomes the dominant species, whereas areas with a lower altitude or a warmer climate (e.g., the Balkans and some parts of Romania) produce very fragrant porcini, mainly the thermophilic species, *B. aestivalis* and *B. aereus*, but also *B. edulis* (the latter often of better quality than northern *B. edulis*) (Sitta, Togni, and Zotti 2007a).

The porcini exported from other continents belong mainly, if not exclusively, to one of the two groups mentioned above. For example, porcini coming from southern Africa (South Africa, Zimbabwe, Swaziland) mainly belong to the mesophilic

group (*B. edulis* and *B. pinophilus*). They are characterized by a weak aroma, a typical but not very intense flavor, and by a complete absence of the characteristic pests of porcini, i.e., dipteran larvae or “maggots.” The absence of maggots, a feature much appreciated by importers, is probably due to porcini being adventitiously introduced to southern Africa along with ectomycorrhizal hosts (pines) but without the dipteran pests; native African Diptera can be found on native species of boletes, but show no interest in porcini.

Southern African porcini fruit during their summer months (November–March, usually peaking between January and March), but production has substantially decreased in the last few years. One possible reason for this decline is that pine plantations suitable for the growth of porcini are getting older or are being replaced by other kinds of plantations such as eucalyptus (Marco Gallino, pers. comm.). Dried southern African porcini were first imported by Italy in the late 1960s (Nando Togni, pers. comm.), but they are no longer sold dried in Italy anymore, only frozen. Most of the southern African porcini crop is now exported fresh to the United States, where they are highly appreciated because of the absence of parasites, making it easy for them to pass Federal Drug Administration (FDA) standards and also easy to work with in the kitchen.

In marked contrast to southern Africa’s porcini, those coming from China (particularly those from Yunnan province) usually have a dry cap cuticle, with very dark (similar to *B. aereus*) to yellowish colors, and a prominently reticulated stipe (the reticulum long-meshed and often raised) that is typically elongated and slender. Though some variation does occur in shape, habit, pigmentation, and characteristics of the cap cuticle, and though our knowledge of Chinese boletes is by no means definitive, we can say with certainty that most of the porcini originating in Yunnan belong to the above-described thermophilic group as typified by *B. aestivalis* and *B. aereus*. This has been confirmed by molecular studies (Mello et al. 2006; Zhao et al. 2006), though only a few specimens were analyzed. Curiously, however, in most Chinese publications there is no reference to the species *B. aestivalis*, even in recent works (Wang, Liu, and Yu 2004; Yang and Piepenbring 2004). Instead, porcini are always referred to either as *B. aereus* or *B. edulis* (more correctly “*B. edulis sensu lato*” in Wang, Liu, and Yu 2004).

Another Asian species, the purplish-hued *B. violaceofuscus*, has been investigated by different authors (Simonini et al. 2001; Mello et al. 2006) along with its North American cognate, *B. separans*. Despite the prime culinary quality of *B. violaceofuscus* (Floriani, Simonini, and Sitta 2000), morphological differences such as the paler spore print plus molecular and chemical differences (absence of the typical *Boletus* pigments and the presence of thelephoric acid, responsible for the violet colors) suggest that *B. violaceofuscus* and *B. separans* should be excluded from the group of boletes commonly known and commercialized as porcini, and should not be sold as such.

Italian Import and Export of Fresh Mushrooms

Italy began importing fresh porcini from neighboring countries, especially Yugoslavia, during the early 20th century. By 1930, commercial imports of fresh porcini had reached significant levels (Bellini 1933). In the 1970s, the import of dried and preserved mushrooms from countries outside Europe (South Africa, China, Russia, South America) began. From Table 1 it can be seen that in recent years the quantities of imported mushrooms mostly exceeded those of exported mushrooms. As we will discuss later, true Italian porcini are only sold fresh in limited quantities locally. Therefore, we may assume that, except for truffles, mushroom export from Italy actually derives from previously imported mushrooms which are simply resold as is, or, in the case of dried or preserved mushrooms, variously treated and packaged before being exported.

The situation for truffles, however, is quite the opposite owing to the scarcity of the white truffle of Alba and Acqualagna (*Tuber magnatum*), which grows only in Italy and a few other localities in Europe, and the worldwide fame of the black truffle of Norcia and Spoleto (*Tuber melanosporum*—the same species as the French Périgord truffle). Truffles are a nationally-registered, high-profile product that is exported to France, Germany, Switzerland, Belgium, the Netherlands, Great Britain, Japan, and the United States. The high prices that truffles command, plus the great demand for the black truffle in France, combine to ensure that the export of truffles from Italy largely exceeds the import, and that most of the exported truffles actually originate in Italy. It is worth noting that the 69 metric tons of fresh truffles exported in 2003 (the year with the

lowest prices, because of a large crop) were valued at more than EUR 13.5 million (Zuchegna 2005).

Table 2 shows the amounts of fresh porcini imported in recent years. Because fresh porcini deteriorate quickly, they mostly originate in countries relatively close to Italy. It is interesting to note that in 2005 the amount of porcini imported from Romania dropped suddenly in conjunction with a dramatic increase in the amount imported from Hungary. This change does not reflect an actual difference in the origin of the porcini, but rather, the “nationalization” of Romanian porcini by the Hungarian customs agency. This “nationalization” was advantageous for Italian importers because in 2005–2006, Hungary was already a member of the European Union while Romania was not, and EU products didn’t need to be held up at Italian customs, contrary to those which arrived from Romania via Serbia (Sitta et al. 2007).

Italian Import and Export of Frozen and Brined Mushrooms

Table 3 shows a significant increase in the quantities of frozen and flash-frozen mushrooms coming from China, which in 2005 constituted 43.5% of the total imported by Italy. Impressive as this figure is, it doesn’t fully capture the Chinese contribution, as a large part of the frozen mushrooms imported from France actually originate in China but are sold to Italian customers by an important French trader.

China also exported significant quantities of frozen cultivated mushrooms such as *Lentinula edodes* and *Pholiota nameko*, included in the same code (07108069) as frozen porcini; thus it is not possible to compare the prices and quantities to see how much cheaper frozen Chinese porcini are compared to those of European origin. It is worth noting, however, that the quality of frozen Chinese porcini has steadily improved in recent years, and the prices are nowadays very close to those of frozen European porcini of comparable quality (Sitta et al. 2007).

Import of frozen mushrooms from Chile is mainly comprised of *Suillus* cf. *luteus*, with lesser quantities of *Lactarius deliciosus* sensu lato and *Morchella* spp.

Italy’s export of frozen mushrooms (the values can be deduced from Table 1) is directed mainly towards France, Germany, Spain, and Switzerland, but the quantities imported from France and Germany exceed those exported. To better

TABLE 1. COMMERCIAL EXCHANGE VOLUME FOR MUSHROOMS BETWEEN ITALY AND OTHER COUNTRIES, 2002–2005, WITH VALUES IN METRIC TONS.

ISTAT Code and Kind of Mushroom	Import					Export						
	2002	2003	2004	2005	2002	2003	2004	2005	2002	2003	2004	2005
Fresh Mushrooms	12,705	9,543	11,600	12,500	3,097	2,624	2,383	2,738				
07095100— <i>Agaricus</i>	5,065	4,955	4,760	6,285	545	799	620	543				
07095200—Truffles	15	4	5	3	49	69	44	56				
07095910— <i>Agaricus</i>	103	74	82	80	169	145	305	145				
07123200, 07123300— <i>Auricularia</i> and <i>Tremella</i>	13	27	29	22	25	23	32	26				
07123900—Other species and truffles	2,227	1,940	2,061	2,070	387	422	413	419				
Mushrooms in brine	16,091	16,570	15,425	18,272	460	643	349	249				
07115100— <i>Agaricus</i>	1,797	1,341	991	641	9	37	0	6				
07115900—Other species	14,294	15,229	14,434	17,631	451	606	349	243				
Frozen mushrooms	15,040	15,563	19,949	21,613	1,477	1,430	1,649	1,910				
07108061— <i>Agaricus</i>	2,104	2,644	3,496	3,667	46	42	51	90				
07108069—Other species	12,936	12,919	16,453	17,946	1,431	1,388	1,598	1,820				
TOTAL	46,179	43,717	49,146	54,557	5,615	5,287	5,131	5,487				

Source: ISTAT-Coeweb (2007), statistics about commerce with foreign countries. Note concerning the codes corresponding to “other species” (from Sitta et al. 2007): Code 07123900 mainly corresponds to dried porcini, and to lesser quantities of other species such as *Lentinula edodes* and *Pleurotus ostreatus* (cultivated) and *Suillus luteus* (wild); the quantity of dried truffles is not relevant. Codes 07108069 and 07115900 include all the frozen mushrooms and brined mushrooms, respectively, excluding those of the genus *Agaricus*. Porcini likely constitute more than half of these quantities, but other species are also present in significant quantities, both cultivated (*Lentinula edodes*, *Pholiota nameko*, *Pleurotus ostreatus* sensu lato, *Vohbatiella voluacea*) and wild (*Cantharellus cibarius*, *Suillus luteus*, *Xerocomus badius*, *Morchella* spp., *Armillaria mellea* and closely related species, and *Lactarius deliciosus* and its close relatives).

TABLE 2. ITALY'S IMPORT OF FRESH OR REFRIGERATED PORCINI (CODE 07095930), 2002–2005, WITH VALUES IN METRIC TONS.

Country	2002		2003		2004		2005	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bulgaria	443	7.4	198	6.0	439	10.3	521	13.6
France	151	2.5	75	2.3	166	3.9	146	3.8
Macedonia	629	10.5	77	2.3	227	5.3	591	15.4
Poland	28	0.5	129	3.9	131	3.1	264	6.9
Romania	2,292	38.4	1,367	41.1	1,673	39.4	259	6.7
Serbia, Montenegro	1,391	23.3	334	10.0	801	18.9	689	17.9
Spain	460	7.7	277	8.3	85	2.0	56	1.5
Hungary	310	5.2	132	4.0	271	6.4	1,046	27.2
Other countries	262	4.4	738	22.2	456	10.7	269	7.0
TOTAL	5,966		3,327		4,249		3,841	

Source: ISTAT-Coeweb, statistics about foreign trade.

comprehend this phenomenon, it would be helpful to know the different species traded, but that data is unfortunately not available.

In contrast to fresh, frozen, and dried mushrooms, brined mushrooms (mushrooms shipped in brine), are never sold to the end-buyer in the same form. Instead, they are normally used for industrial processes, i.e., to produce sauces or other mushroom products. Because they are stored in brine, they need to be washed or rinsed repeatedly and, often, aromatized.

Aside from porcini, the principal wild mushrooms that are imported brined are chanterelles (*Cantharellus cibarius*) and honey mushrooms (*Armillaria mellea* and close relatives). The data for brined mushrooms show an even greater

contribution from Asian countries than for frozen mushrooms. In large part this can be explained by the high percentage of cultivated species that are brined. Vietnam, for example, is not a major exporter of frozen or dried mushrooms, but is Italy's second most significant source of brined mushrooms, primarily *Volvariella volvacea*, commercially known as the straw mushroom and in Italian called *fungo del muschio* ("moss mushroom").

Italian Import and Export of Dried Mushrooms (Porcini)

As already pointed out, dried wild mushrooms in Italy consist almost entirely of dried porcini (Sitta, Togni, and Zotti 2007a). The origins of

TABLE 3. ITALY'S IMPORT OF FROZEN MUSHROOMS, EXCLUDING THE GENUS *AGARICUS* (CODE 07108069), 2002–2005, WITH VALUES IN METRIC TONS.

Country	2002		2003		2004		2005	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bulgaria	719	5.6	446	3.5	760	4.6	1,340	7.5
Chile	777	6.0	814	6.3	849	5.2	692	3.9
China	2,500	19.3	3,787	29.3	5,696	34.6	7,720	43.0
France	1,780	13.8	1,721	13.3	1,667	10.1	1,708	9.5
Macedonia	185	1.4	103	0.8	244	1.5	327	1.8
Poland	611	4.7	414	3.2	625	3.8	394	2.2
Romania	1,781	13.8	1,225	9.5	2,200	13.4	1,294	7.2
Russia	263	2.0	250	1.9	524	3.2	555	3.1
Serbia, Montenegro	1,273	9.8	839	6.5	980	6.0	795	4.4
Turkey	385	3.0	254	2.0	153	0.9	290	1.6
Hungary	39	0.3	39	0.3	171	1.0	694	3.9
Other countries	2,623	20.3	3,027	23.4	2,584	15.7	2,137	11.9
TOTAL	12,936		12,919		16,453		17,946	

Source: ISTAT-Coeweb, statistics about foreign trade

TABLE 4. ITALY'S IMPORT OF DRIED MUSHROOMS DURING THE PERIOD 1983–1986, WITH VALUES IN METRIC TONS.

Country	1983		1984		1985		1986	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bulgaria	88	6.8	22	1.3	57	3.7	53	4.0
China	2	0.2	1	0.1	2	0.1	1	0.1
Romania	30	2.3	39	2.3	53	3.4	15	1.1
South Africa (incl. Namibia, Swaziland)	16	1.2	14	0.8	24	1.5	28	2.1
Yugoslavia	1,074	83.3	1,570	91.4	1,323	84.9	1,123	84.2
TOTAL	1,290		1,718		1,558		1,333	

Note: The totals are greater than the sums of the individual countries and the percentage columns do not add up to 100% because the category “Other Countries” was not listed for those years. Sources: Togni 1985; Togni and Fiandri 1986, 1987.

Italy's imported dried porcini have changed dramatically in the last 20 years. This can be seen by comparing the recent Italian import data (Table 5) with data from the years 1983–1986 (Table 4). In the 1980s, dried mushrooms were comprised of a higher percentage of porcini and a lower percentage of cultivated mushrooms than at present and were imported almost exclusively from Yugoslavia, Bulgaria, and Romania. During this time, the import of expensive South African “extra” (first quality) dried porcini was increasing, and the quantity of dried mushrooms coming from China was negligible. The amount of mushrooms imported from Yugoslavia was much higher than at present, both in actual quantity and relative to China, while the amount imported from Bulgaria and Romania was significantly lower than now. The amount of dried mushrooms exported by Italy during the 1980s totaled less than half of the present amount (see Table 1),

and was directed mainly toward France, Switzerland, and the United States.

Nowadays, in contrast, the Chinese contribution to Italy's import of dried mushrooms comes to roughly 50% of the grand total (see Figs. 2, 3, 4, 5 and 6). Table 5 (covering the years 2002–2005) shows how China has overtaken the Slavic countries as the main exporter of dried mushrooms to Italy. In 2003, China surpassed Serbia, and in 2004–2005, it surpassed the combined exports of all the countries constituting the former Yugoslavia (Serbia and Montenegro, Bosnia and Herzegovina, Croatia, Macedonia). In Table 5, the figures for porcini are lumped together with dried mushrooms of other species as well as dried truffles. The contribution of the truffles may be relevant in terms of value, but surely not because of their weight. The contribution of other mushrooms, including cultivated species such as *Lentinula edodes* and *Pleurotus ostreatus*, is difficult to

TABLE 5. ITALY'S IMPORT OF DRIED MUSHROOMS AND TRUFFLES (ALSO IN FRAGMENTS, SLICES, GROUND, OR PULVERIZED), 2002–2005, EXCLUDING *AGARICUS*, *AURICULARIA*, AND *TREMELLA* SPP. (CODE 07123900), WITH VALUES IN METRIC TONS.

Country	2002		2003		2004		2005	
	Quantity	%	Quantity	%	Quantity	%	Quantity	%
Bosnia and Herzegovina	56	2.5	48	2.5	31	1.5	48	2.3
Bulgaria	384	17.3	197	10.2	205	9.9	262	12.7
China	487	21.9	593	30.6	1,019	49.4	905	43.7
Republic of Macedonia	174	7.8	82	4.2	103	5.0	132	6.4
Romania	450	20.2	376	19.4	272	13.2	201	9.7
Serbia and Montenegro	597	26.8	530	27.3	296	14.4	295	14.3
Other countries	79	3.5	114	5.9	135	6.6	226	10.9
TOTAL	2,227		1,940		2,061		2,069	

Source: ISTAT-Coeweb, statistics about foreign trade.



Fig. 2. Most dried “Italian porcini” (a) are not Italian at all, but originate in eastern Europe or, especially, in Yunnan province, China, where a cottage industry has sprung up to support Italy’s demand for porcini. A teen-age Yunnan Naxi girl (b) has collected a bag of porcini to sell and a handful of wildflowers to decorate her home. (David Arora, all rights reserved).

estimate, but porcini still constitute the bulk of dried mushrooms exported by China to Italy.

The Quality of Dried Porcini

Dried porcini differ not only in their geographical origin, but also in the desiccation method. Even though some species of porcini are more aromatic than others, the fragrance of dried porcini, highly appreciated by Italians, is

heavily influenced by the drying process. The color and the size of the slices also have an important influence on the commercial value, e.g., light-colored porcini in large pieces are more expensive than smaller or darker ones. Italian law defines three commercial categories for dried porcini: *extra* (first quality), *speciali* (intermediate quality, with darker color and some defects), and *commerciali* (the darkest colored, with more

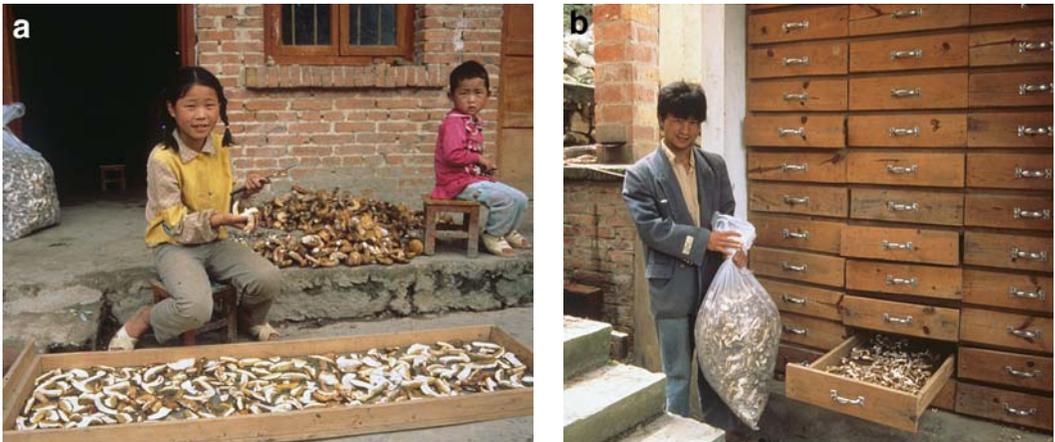


Fig. 3. In dozens of “porcini villages” scattered through Yunnan, the porcini are sliced by hand and dried in the sun or in homemade, wood-fired dryers especially designed for the purpose. (David Arora, all rights reserved)



Fig. 4. Hu Gui Xiang is the proud owner of his own porcini business in Kunming, the capital of Yunnan. He began as a mushroom picker in a small “porcini village,” and now uses his contacts there to buy porcini which he – along with dozens of other small companies – sell to larger companies who export them to Europe. (David Arora, all rights reserved)



Fig. 5. The dried porcini are meticulously sorted, trimmed and cleaned by women in Kunming. (David Arora, all rights reserved)



Fig. 6. Kunming street scenes: bags of dried porcini, and huge white barrels of brined mushrooms in the background. (David Arora, all rights reserved)

defects and cut in smaller pieces). These defects allowed by Italian law include blackened dried mushrooms as well as pieces with maggot holes.

Many porcini of European origin are still sliced by hand and dried at home, usually under the sun. Such “traditional” porcini are easy to recognize as they are irregularly cut, of variable thickness, light hazel to brown in color (very rarely white or whitish), and intensely aromatic. Most of these home-dried porcini are from the Balkan countries; hence they are referred to by Italian importers as “original Slavic dried porcini.” These are much appreciated by Italian consumers despite occasional problems with molds or parasites feeding on the dried mushroom fragments; due to their darker color, they are usually less expensive than the other European dried porcini.

The remaining European dried porcini are processed in large collection centers, where the mushrooms are cut by machines and systematically dried with large dehydrators. Compared to the “original Slavic” product, the slices are thinner, their size more uniform and usually bigger, the color whiter, and the aroma often less intense (though again, this may vary depending on the species of porcini used).

Dried Chinese porcini, which now represent approximately half of all the dried porcini sold in or exported by Italy, originate mostly in Yunnan province. They are prepared there in villages with small hand-made dryers heated with embers or burning wood, coal, maize, or other materials. The fire is typically kept closed and separated from the drying mushrooms, so that the smoke is conveyed elsewhere and the mushrooms do not acquire a smoky flavor. The mushrooms are placed on screens or grates in the upper part of the dryer. The quality of the Chinese product is improving, but Chinese porcini can suffer from several quality control problems. For example, drying temperatures may be higher than optimum, causing the mushrooms to “bake” slightly, i.e., the dried mushrooms tend to be hard or rigid (and often wrinkled in a recognizable way), with a strong browning or blackening of the flesh and a higher number of dried maggots (Palumbo and Sitta 2007). The aroma and flavor are also influenced by the drying technique, which may produce a variable and inconsistent product: sometimes smoky, sometimes slightly sour or musty, and sometimes like spices or glutamate or even tobacco. Some of these characteristics

may be acquired when production is large and small dryers are insufficient, because larger dryers normally used for tobacco, tea, or spices are then pressed into service, but when these porcini are mixed with other porcini, the result is a perfectly acceptable “hybrid” porcini smell and taste.

Dried southern African porcini, regularly imported by Italy in the latter part of the 20th century and prized for their white color, big size, and absence of larvae, are almost nonexistent today. Instead, nearly all of the southern African product is sent fresh to the United States or is frozen. Dried northern African porcini (mainly from Morocco) are likewise absent today in Italy, as they are notorious for the frequent presence of sand particles actually embedded in their flesh.

Discussion: Do Italian Porcini Really Come from Italy?

Porcini are now considered an essential part of traditional Italian cuisine and culture. Up until 1950, Italian production was able to satisfy, more or less, national demand for both fresh and dried porcini, and Italian porcini (mostly dried) were also exported (Sitta, Togni, and Zotti 2007a). Over the last 60 years, however, the situation has changed dramatically. Since the 1950s, Italy’s demand for porcini grew as imported porcini became widely available at lower prices. The result is that most of the epigeous wild mushrooms sold in Italy—porcini as well as other species such as brined chanterelles—actually originate abroad. Almost all wild mushrooms exported by Italy likewise originate elsewhere, even though they may be labeled “Product of Italy.”

The current domestic production of porcini in Italy is difficult to evaluate. Without a doubt, the productive potential of some forest ecosystems has been progressively compromised, as described by Pipino (1972) for Calabria. Since there has been no demonstrated cause-effect relationship between mushroom picking and declining production (Egli et al. 2006), the cause of the decline has probably to do with different practices of forest management nowadays as opposed to the past, and/or with the ages and species compositions of contemporary forests, and with different environmental (e.g., climatic) conditions.

Moreover, much of Italy’s domestic porcini production is not available to the market for two significant reasons: (1) large quantities of porcini are picked by nonprofessionals for their own consumption; and (2) the prices of imported fresh, dried, and

preserved mushrooms (including porcini) are significantly lower than for Italian porcini. The result is that dried porcini actually originating in Italy are virtually nonexistent on the market. Suffice it to say that an Italian collector would never sell, in an average year, a kilo of fresh porcini for less than EUR 10. If one assumes a fresh:dry ratio of 10:1 (i.e., 10 kg fresh porcini reduces to about 1 kg dried), and one adds in the costs related to the industrial treatment (sorting, slicing, drying, etc.) of the mushrooms, then dried Italian porcini—and not even those of the highest quality—would definitely cost more than EUR 100/kg. On the other hand, wholesale dried porcini of prime quality imported from eastern Europe typically cost between EUR 40 and EUR 70/kg (Palumbo and Sitta 2005), while dried porcini of lesser quality from eastern Europe as well as most of the dried porcini from China typically cost between EUR 20 and 40/kg wholesale. It is hardly surprising, then, that there is no large-scale trade in the porcini collected in Italian forests, though small quantities are sold fresh locally to restaurants or small shops.

Conclusion

The twin processes of nationalization and globalization can be seen in the dramatic changes that have occurred in Italy's wild mushroom commerce over the last 100 years. On the one hand, porcini have become a highly salient feature of Italy's emerging national, urban-based cuisine at the expense of various other wild mushroom species that were once favored regionally or locally. On the other hand, Italy's increased demand for porcini soon exceeded its supply, and Italy began importing porcini to fulfill its domestic needs as well as to export them dried under the Italian name "porcini," in many cases even identifying the dried mushrooms as "Italian porcini" or as a "Product of Italy."

Strong demand for porcini makes them an important nontimber forest product, the sale of which contributes substantially to rural livelihoods no matter where they come from. However, because porcini are associated in consumers' minds with Italy (the very name itself being Italian), dried porcini packaged and exported by Italy have far more cachet in Europe and North America than porcini from elsewhere. In other words, a kind of national branding has taken place, where porcini have become a symbol of Italy's culinary heritage and natural bounty. This

branding, which may have had its beginnings in the 19th century with small quantities of dried porcini exported by Italy to North America, ironically developed fully only after Italy's porcini exports ceased to originate in Italy. Eastern Europe initially supplied most of Italy's dried porcini, but China's contribution doubled between 2002 and 2005. While Italy provides an additional layer of quality control to the porcini that it imports and then re-exports, labeling these wild mushrooms that originate elsewhere as "Italian porcini" is misleading, and also runs counter to the resurgent interest in honoring local origins, whatever they may be, as evidenced by the European Union's various rules for regional denominations, and by the growth of the "slow food" movement, which is all about identifying and respecting local production.

While it is impossible to predict the future, it seems clear, in the short term, that the Balkans, Romania, and, above all, Yunnan Province in China will continue to supply most of Italy's commercially valuable dried mushrooms, and that the wonderful woody aroma and taste that people associate with Italian porcini will actually be the aroma and taste of Slavic and Chinese porcini.

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Appendix

SCIENTIFIC AND ITALIAN COMMON NAMES OF THE MUSHROOM SPECIES CITED IN THE PAPER. THE NAMES CITED IN PARENTHESES ARE SELECTED SYNONYMS COMMONLY FOUND IN POPULAR MYCOLOGICAL LITERATURE.

Scientific Name	Italian Common Name
<i>Agrocybe aegerita</i> (F. Briganti) Singer (= <i>Pholiota aegerita</i> [F. Briganti] Quél.)	<i>piopparello, pioppino</i>
<i>Amanita caesarea</i> (Scop.) Pers.	<i>ovolo buono, cocco</i>
<i>Armillaria mellea</i> (Vahl) P. Kumm.	<i>chiodino</i>
<i>Boletus aereus</i> Bull.	<i>porcini</i>
<i>Boletus aestivalis</i> (Paulet) Fr.	<i>porcini</i>
<i>Boletus edulis</i> Bull.	<i>porcini</i>
<i>Boletus mamorensis</i> Redeuilh	<i>porcini</i>
<i>Boletus pinophilus</i> Pilát & Dermek	<i>porcini</i>
<i>Boletus regius</i> Krombh.	
<i>Boletus separans</i> Peck	
<i>Boletus variipes</i> Peck	
<i>Boletus violaceofuscus</i> W.F. Chi	
<i>Calocybe gambosa</i> (Fr.) Donk (= <i>Tricholoma georgii</i> [L.] Quél.)	<i>prugnolo, spignolo, fungo di S. Giorgio</i>
<i>Cantharellus cibarius</i> Fr.	<i>galletto, finferlo</i>
<i>Craterellus lutescens</i> (Pers.) Fr. (= <i>Cantharellus lutescens</i> [Pers.] Fr.)	<i>finferla</i>
<i>Craterellus cornucopioides</i> (L.) Pers.	<i>trombetta da morto</i>
<i>Hydnum repandum</i> L.	<i>steccherino, dentino</i>
<i>Lactarius deliciosus</i> (L.) Gray	<i>sanguinello, rosito</i>
<i>Lactarius tesquorum</i> Malençon	
<i>Leccinum corsicum</i> (Rolland) Singer (= <i>Boletus corsicus</i> Rolland)	<i>leccino</i>
<i>Leccinum lepidum</i> (Essette) Quadr. (= <i>Boletus lepidus</i> Essette)	
<i>Lentinula edodes</i> (Berk.) Pegler	<i>shii-take</i>
<i>Lyophyllum fumosum</i> (Pers.) P.D. Orton	<i>famigliola</i>
<i>Macrolepiota procera</i> (Scop.) Singer (= <i>Lepiota procera</i> [Scop.] Gray)	<i>mazza da tamburo</i>
<i>Marasmius oreades</i> (Bolton) Fr.	<i>gambesecche, cappelline</i>
<i>Pholiota nameko</i> (T. Itô) S. Ito & S. Imai	<i>nameko</i>
<i>Pleurotus cornucopiae</i> (Paulet) Rolland	
<i>Pleurotus eryngii</i> (DC.) Quél.	<i>cardoncello</i>
<i>Pleurotus ostreatus</i> (Jacq.) P. Kumm.	<i>gelone, orecchione</i>
<i>Polyporus corylinus</i> Mauri	<i>sfogatello del nocchio</i>
<i>Suillus granulatus</i> (L.) Kuntze	<i>pinarolo</i>
<i>Suillus luteus</i> (L.) Roussel (= <i>Boletus luteus</i> L.)	<i>pinarolo</i>
<i>Tricholoma effocatum</i> (Mauri) Lanzi	
<i>Tricholoma portentosum</i> (Fr.) Quél.	<i>cicalotto</i>
<i>Tricholoma terreum</i> (Schaeff.) P. Kumm.	<i>morette</i>
<i>Tuber himalayense</i> B.C. Zhang & Minter	
<i>Tuber indicum</i> Cooke & Massee	
<i>Tuber magnatum</i> Pico	<i>tartufo bianco di Alba e di Acqualagna</i>
<i>Tuber melanosporum</i>	<i>tartufo nero di Norcia</i>
<i>Volvariella volvacea</i> (Bull.) Singer	<i>fungo del muschio</i>