The British species of Otidea (2). O. alutacea and related taxa

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Introduction

Based on studies of multilocus phylogenies of Otidea (Pers.) Bonnd., Hansen & Olariaga (2015) estimated the number of species involved in the genus to be 47, although a monograph of the genus simultaneously published by Olariaga & Hansen (2015) recognised 33 species. Both studies concluded that O. alutacea (Pers.) Masssee is a complex of taxa, and the latter demonstrated the presence of five phylogenetic groups or clades within this complex. As their study excluded many British collections, an analysis is presented here of the UK O. alutacea collections and related taxa, based on morphology and examination of a small number of molecular data obtained at Royal Botanic Gardens, Kew (K), in comparison with other molecular data available in GenBank.

Material and methods

During the current Otidea study, 548 British collections held at K were examined, as well as 74 from other European countries and 6 from North America. Also examined were Persoon’s type collections held at L and other type collections held at MICH, PRM and HMAS. Thin hand-sections, to examine excipulum and hymenial elements, were mounted initially in water to observe surface encrustation, and later stained with Melzer’s reagent (the slides later prepared as semi-permanent by addition of lactic acid). Drawings using a drawing tube were prepared of spores, paraphyses, and ectal excipular elements under oil immersion at ×1600. UV light reflection of dried and, when available, fresh specimens was studied under a 6W UV lamp in a dark box, switchable between two wavelengths of 254 and 365 nm, viewed through a UV filter. The reflection was compared with the colour chart by Ridgway (1912). Duration of exposure of each specimen to one UV light source was limited to 5 seconds at most. As well as DNA samples extracted by Brock et al. (2011), but are indistinguishable from each other except for subtle difference in hysmenium colour. One taxon is morphologically distinct from the epitype in spor size range and in hysmenium colour. An ITS sequence from a British collection is identical to those of clade 1 of Olariaga et al. (loc. cit.). This clade is strongly supported within the O. alutacea complex and warrants recognition at varietal level. It is described here as O. alutacea var. parvispora. In addition, the interpretations of O. felina and of O. alutacea var. microspora are considered, and an aberrant specimen with ovoid spores belonging to a fourth clade is reported. A lectotype is selected for O. alutacea var. microspora.

Keywords: Ascomycota, Pyrenomataceae, Otidea alutacea, morphology, phylogeny, typification.

Specimen citation for the United Kingdom is in chronological order. Publication dates of individual plates are based on Stafleu & Hannega (1993, 1995) and subsequent online supplements. All scale bars on illustrations correspond to 10 μm. Kew accession numbers are in the form K(M)12345.

Typification

The original description of Peziza alutacea (PERS., 1799: 78) was discussed by Carbone (2011) who demonstrated that an illustrated plate by Bulliard (1783-84: t. 1548) represented the sole element cited in the protologue, and hence served as the holotype of Peziza alutacea. This plate includes six illustrations, marked A, B, C, D, E as well as one unmarked figure which, judging from the accompanying text, should have been marked F. As noted by Carbone (loc. cit.) and also by PARSLOW & Spooner (2013), the illustration B shows a pale otideoid fungus with three clustered fruitbodies, while C and D are of a segment of the same or a similar fungus, the rest referring to a different, dark-coloured otideoid species, or multiple species. Subsequently, Persoon (1822: 221) chose the illustration B for P. alutacea. To reflect this choice, Carbone (loc. cit.) designated 1548 as lectotype of P. alutacea. Carbone (loc. cit.) also studied Persoon’s two original collections of P. alutacea held at L, and considered that both collections are of P. alutacea. He selected one of them, L910.261-13, to serve as epitype of P. alutacea, and hence of Otidea alutacea.

Having also studied Persoon’s original collections at L, the current authors (PARSLOW & Spooner, 2013) found that the epitype specimen matched Persoon’s description of P. alutacea, whereas L910.261-12 proved referable to another species, O. bufonia, also as concluded by Harmaaja (2009).

Given that O. alutacea was shown by Olariaga et al. (loc. cit.) to be a species complex, it is unfortunate that the epitype cannot provide molecular data which would be required for a precise application of the name. This problem will be rectified at a later date.

Results

1. Description and morphological characters of O. alutacea sensu lato s. Olariaga et al.

 Otidea alutacea (Pers.) Masssee, Brit. fung.-fl., 4: 446 (1895).
 Scolodella alutacea (Pers.) Gray, A natural arrangement of British plants, 1: 668 (1821).
The description below is amended slightly from that given by Olariaga et al. (2015) and serves to contrast with the new taxon described below. It is based on the epitype, L910.261-13 (Fig. 1), examined by the current authors at L, supplemented with characters of K(M)159266 (Fig. 2).

The ITS sequence from this specimen (GenBank accession, KT818925) is almost identical (Ident. 99%) to others in GenBank (accession numbers KMO100075, KMO100074, KMO100073, KMO100072, and KMO100071; BLAST query coverage 100%), to which Olariaga et al. (loc. cit.) applied the concept of O. alutacea sensu stricto. This concept was based solely on spore size which they perceived to differ from that of the other clades, although stating it to be 'slightly overlapping' with that of another clade, numbered 3b. However, the spore size for these two clades is actually identical based on their measurements and that from British material K(M)142010 (Fig. 3; GenBank accession KT818924) so that there is no basis for application of 'sensu stricto' to either of these clades.

**Apothecia** solitary or clustered, ear-shaped to almost cup-shaped when young, later mostly broad truncate, split on one side, sessile or short-stipitate. Outer surface Fawn Color (XL13’’’) when fresh, when young, later mostly broad truncate, split on one side, sessile or to a closely related taxon. 93 of these are morphologically consistent, as demonstrated by CARBONE (2011). When MASSEE (1895: 446) made the combination in *Otidea* at K, the oldest specimen which correctly carried the epithet *O. alutacea* sensu lato is one of the most commonly recorded in Britain, surpassing only by *O. onotica* (Pers.) Fuckel and *O. bufonia* (Pers.) Boud., except in Scotland where it is apparently rare, perhaps due to lack of appropriate host trees. In the current study, of 548 British fungus collections of *Otidea* examined, 144 prove referable to *O. alutacea* or to a closely related taxon. 93 of these are morphologically referable to *O. alutacea sensu stricto* (s. OLARIAGA et al., 2015), and were recorded from 27 vice counties (VCs) in England, 5 VCs in Wales and 2 VCs in Scotland. However, distribution of the phylogenetic taxon strictly identical to K(M)159266 (Genbank EU818925) is not yet clear.

2. Interpretation of the epithet by British authors

Although this epithet is well known to British mycologists, its earliest interpretation, both within Britain and elsewhere, was inconsistent, as demonstrated by CARBONE (2011). When MASSEE (1895: 446) made the combination in *Otidea* at K, he wrote "spores elliptic oblong, ends obtuse, continuous, 2-guttulate, smooth at first, then minutely verruculose and with a faint tinge of brown, 14–16 × 6–7 μ, 1-seriate; paraphyses slender, apex clavate, brownish", referring to *Fung. Rhen.* (1864), Fung. Rhen. 1229. Two examples of this exsiccatum examined at K (K(M)158712 and K(M)158713, Germany) both proved referable to *Peziza petetti* Berk., thus Massee’s concept was clearly not of an *Otidea*. It is probable that Massee followed Cooke (1876) and Phillips (1887), both of whom wrongly applied this name to *Fung. Rhen.* 1229.

Being aware of this confusion, we re-examined British collections of *Otidea* at K, comparing them to available type material from Britain and elsewhere. As noted, there are 144 British collections at K which belong to the *O. alutacea* species group, of which 93 are morphologically consistent with the epitype. Many had previously been misnamed as *Peziza* or *Otidea* leporina (named by M.J. Berkeley, M.C. Cooke, C.E. Broome, W. Phillips, W.D. Graddon); *cochleata* (by Berkeley, Broome, Phillips, C. Crossland, A. Bloxam, J.D. Hooker); *bufonia* and its synonym *umbrina* (Dennis). Based on morphology only, the oldest British specimen of *O. alutacea* at K originated from herb. J.D. Hooker [sub *Peziza cochleata* Huds., Scotland?], 1380, K(M)154583. The oldest specimen which correctly carried the epithet *alutacea* originated from herb. M.J. Berkeley [sub *Peziza alutacea*, Wales, Denbighshire, Abergele, Coed Coch, 1877, Berkeley, K(M)155742]. At the same time, the epithet *alutacea* had erroneously been applied not to either of these clades.
only to related taxa, but also to other species of *Otidea*, including *O. bufonia*, *O. onotica*, and two other currently unnamed taxa with encrusted excipulum.

During the present study, we became aware that there were at least two taxa involved amongst British collections referred to *O. alutacea*, differing most obviously in spore size. It became apparent that *Dennis* (1960, 1968) based his concept of *O. alutacea* on determinations by Le Gal [as in K(M)157726, Northern Ireland, Co. Down, British collections using GenBank data deposited by Olariaga et al.] and by Nannfeldt [as in Fung. Suec. Exic. 3276, K(M)158714, and 3277, K(M)158715], i.e. a taxon with smaller spores than those of the epitype. Nannfeldt noted on the labels of these exsiccata, "the fungi distributed here as nos. 3276-3277 fall both within what is conventionally named *O. alutacea*, but their name remains doubtful until the genus is critically revised."

It is notable that, among the older specimens of *O. alutacea* held at K, the majority were large spored, morphologically agreeing with *O. alutacea sensu stricto* s. Olariaga et al. The proportion of the total number of these against the total number of the *O. alutacea* group was highest in the 19th century, but has declined since then, as further discussed below.

### 3. Interpretation of molecular data

Hansen & Olariaga (2015) provided a strong hypothesis for species delimitation within the genus, by recognising phylogenetic species by genealogical concordance, and using multilocus phylogenies to study the interspecific relationships. Based on this study, Olariaga et al. (2015) concluded that *O. alutacea* was part of a complex of taxa. Their large subunit rRNA phylogeny resolved several closely related clades, which are also supported in their multigene phylogeny (Hansen & Olariaga, loc. cit.). They demonstrated that ITS sequences were too variable to align throughout the genus, but were effective to distinguish between closely related taxa. The concept of *O. alutacea sensu stricto* they assigned to what they considered to be the only clade in which the spore size range matched that of the epitype.

The British collections of *O. alutacea* involved at least two taxa, both with relatively narrow spore ranges, hardly overlapping with each other. Provisionally, they had been accessioned at K as *O. alutacea* and *O. alutacea* (aff.). However, analysis of ITS sequences of British collections using GenBank data deposited by Olariaga et al., shows that both of them consist of two or more taxa. Included in the former are *O. alutacea sensu stricto* s. Olariaga et al., represented by K(M)159266 (GenBank KT818925), and clade 3b represented by K(M)142010 (GenBank KT818924). Included in the latter are clade 1, represented by K(M)70199 (GenBank EU784380), and a new clade, represented by K(M)81596 (GenBank EU784381) and K(M)145938 (GenBank KT818926). The single best tree from RAxML Maximum Likelihood analysis is shown in Fig. 4.

K(M)159266 and K(M)142010 are morphologically identical, except for a slightly denser subhymenial pigmentation in the latter (appearing as a marginally thicker line of dark brown colour than the former when dry). The spore range of the latter is 15.5–17.0 (–18.0) × 7.0–8.0 μm, Q=2.00–2.21, average 2.14 (n=36), almost exactly coinciding with that of the former. Due to the lack of sequence data from the epitype, the concept sensu stricto cannot be unequivocally referred to one or other of the two morphologically identical clades as noted above.

The ITS sequence of K(M)70199 (EU784380) is phylogenetically identical (Coverage 100%, Ident. 99%) to clade 1 of Olariaga et al. (loc. cit.). There is no overlap in the spore size between *O. alutacea sensu stricto* s. Olariaga et al. and K(M)70199, as also stated by Olariaga et al. (loc. cit.: 183) for clade 1. This taxon warrants recognition as a variety of *O. alutacea* as proposed below.

**Otidea alutacea var. parvispora**, var. nov. — IF 551565

**Diagnosis:** pale fawn coloured, macroscopically as in the typical variety of *Otidea alutacea* (Pers.) Massae, differing only in the pale hymenium which dries buff, and microscopically in less yellow pigmentation on cell walls in the medullary excipulum and subhymenium, in smaller ascospores and shorter asci than those of the typical variety.

**Holotype:** UK, England, Surrey, Kew, near Quercus ilex, Legon, 19 Oct. 2000, K(M)70199 (Fig. 5a, 5b).

**GenBank accession number (ITS) of holotype:** EU784380.

**Etymology:** referring to the spore size, which is markedly smaller than that of the typical variety.
Fig. 4 – Maximum likelihood tree using ITS sequences from specimens belonging to the European *Otidea alutacea* complex including five British collections, with *Otidea papillata* as the outgroup. Numbers above branches are non-parametric bootstrap values.

**Apothecia** clustered, truncate or ear-shaped when young, outer surface pale Fawn Color (XL13’’) when fresh, drying Warm Buff (XV17’d), hymenium Light Ochraceous-Buff (XV15’d) when fresh, drying Warm Buff (XV17’d). **Ectal excipulum** a textura globulosa to angularis, cells mostly 20–27 (–35) μm diam., often smaller at the surface, thin-walled, with short outgrowing chains of cells, hyaline or pale yellow, unencrusted. **Medullary excipulum** a textura intricata, pale yellow. **Subhymenium** pale yellow when fresh, showing as a thin, pale brown zone when dry; hyphal walls apparently lacking pigmentation. **Ascospores** smooth, biguttulate, ellipsoid, almost parallel-sided in face view but less so than in the typical variety due to shorter spore lengths, ends broad, bluntly rounded, (11.0–) 11.5–13.0 × 5.0–6.5 μm, Q=1.73–2.28, average 2.04 (n=41). **Asci** 165–185 × 9.0–10.0 μm, 8-spored, arising from croziers. **Paraphyses** (2.5–) 3–4 μm wide at middle, apex curved to hooked, slightly enlarged to 4-5 μm wide, with pale yellowish granular inclusion, deeper staining in Melzer’s reagent.

**Habitat and distribution:** the precise distribution of this taxon which phylogenetically corresponds to K(M)70199 is still to be investigated.

This taxon may correspond to BRESADOLA’S (1900) description of *O. felina* (Pers.) Bres., but not to the holotype of *Peziza felina*, L910.256-815. OLARIAGA et al. (2015: 184) suggest that the relevant clade (their clade 1) should be compared to *O. kunmingensis* W.Y. Zhuang which they refer to *O. alutacea* complex despite the fact that they did not examine the type. The spore range of this species, 10.3–11.7 × 5–6 μm (in the protologue, ZHUANG & YANG, 2008: 238), hardly overlaps with that of K(M)70199. Furthermore, the apothecia are described as having olivaceous yellow tones, and it is unlikely that this species belongs to the same taxon as K(M)70199. Molecular data for the type or an authentic *O. kunmingensis* are not available.

This taxon, or morphologically indistinguishable taxa, represented in K by 51 collections which currently lack sequence data, are widespread in Southern England, East Anglia and The West Mid-
lands, being recorded from 24 English vice counties. Three originate from Northern Ireland and two from Scotland; none is yet known from Wales. They are most frequently recorded from near Quercus spp. or Fagus sylvatica, between August and early December. Whether or not those collected under Pinus sp. and other trees belong to the same phylogenetic taxon is still to be investigated.

**Selected illustrations based on morphology:** Dennis (1968), VIIIB [drawn from his collection, Northern Ireland, Clandeboye, Dennis, Sep. 1948, K(M)157726].

Two other British collections, K(M)81596 (England, Oxford, Harberton Mead, near Quercus sp., 12 Oct. 2000, Webb) and K(M)145938 (see below), have ITS regions which are identical to Otidea alutacea no. 17 (5-F267085, i.e. MC201005) of Olariaga et al. (*loc. cit.*) and form another clade. K(M)145938 is aberrant in having uniformly ovoid spores, and was initially considered to be a new species. It is reported below. K(M)81596 is morphologically similar to the type of *O. alutacea* var. *parvispora* except for a slight difference in the colour of the hymenium, and the amount of yellow pigmentation in sub-hymenium, which in the latter are lighter.

**Interpretation of Otidea felina**


Having examined the holotype (L910.256-815) of *Peziza felina*, Harmaja (2009), Van Vooren & Carbone (2012) and the current authors (Parslow & Spooner, 2013) all considered *O. felina* a taxonomic synonym of *O. alutacea*. However, the measurements of ascospores and ascii of the holotype published by Van Vooren & Carbone (*loc. cit.*; ascii average 150 μm in length, spores 14–16 × 6–6.5 μm) were slightly smaller than those made by the current authors, i.e. asci 160–170 × 10–11 μm, spores 15–17.5 × 6.5–7.5 μm, average 16.1 μm (n=22). This latter spore range agrees well with that of *O. alutacea sensu stricto*. Olariaga et al., and also with that of clade 3b as represented by a British specimen, K(M)142010, with spores 15.5–17 (–18) × 7–8 μm. *Peziza felina* may belong to one of these two clades, but was
described ‘ex vivo denuo describenda’ as grey, hence unlike other known collections from these clades. However, Van Vroen & Cárbone (2012) stated that the holotype collection was heavily parasitized and, during the present study, the outer surface of this collection was found to bear numerous brown-pigmented, globose spores. The grey colour of the fresh apothecia may have been due to this process. During the present study, the outer surface of this collection was heavily parasitized (2012) stated that the holotype collection was heavily parasitized, another specimen, A.H. Smith 17699, is given as type. Smith 9351 is also cited here but not marked as type, together with another specimen, Smith 30502. As two different collections, Smith 9351 and 17699, are indicated as type, they should both be regarded as synonyms; 30502 is a paratype for this species. Having studied these three collections preserved at MICH, the current authors support the conclusion by Olariaga et al. (loc. cit.) that Smith 9351 (MICH barcode 14407) belongs to the O. alutacea species group, and has larger spores than given in the protologue. Both Smith 17699 (MICH barcode 14406) and Smith 30502 (MICH barcode 02016) have pale yellow apothecia, with yellowish brown, encrusted excipular cells and spores 10–11.5 × 5.5–6.5 μm. They are conspecific and correspond to the diagnosis of O. alutacea var. microspora. As the two syntypes represent different species, a lectotype is required for O. alutacea var. microspora (McNeill et al., 2012, Melbourne Code, Art. 9.12), as also suggested by Olariaga et al. (loc. cit.). Only Smith 17699, MICH barcode 14406, matches the diagnosis and this is here designated as the lectotype of Otidea alutacea var. microspora Kanouse. Olariaga et al. (loc. cit.) demonstrated that an ITS sequence from the paratype of O. alutacea var. microspora (Smith 30502, GenBank AF072094) is almost identical to the sequence they obtained from the holotype of O. rainierensis Kanouse (Smith 30553, MICH barcode 14410, GenBank KF717583). Further, they found that this latter sequence and that of the holotype of O. kauffmanii (MICH barcode 14409, GenBank KF717579) are also almost identical. They hence concluded that O. rainierensis and O. kauffmanii are synonymous, and chose O. rainierensis as the name for the species. It should be noted that on the GenBank website, the holotype of O. kauffmanii appears under O. rainierensis, with no reference to its original name. It should also be noted that 30502 involves two elements, i.e. one caespitose group of 4 yellow-brown, stipitate apothecia and one solitary, pale-coloured, sessile apothecium. It is not known from which of these apothecia the ITS sequence was derived. Otidea kauffmanii has previously been reported from the British Isles based on two English collections (K(M)143475, South Devon, Torquay, 18 Dec. 2006, Roberts; K(M)137477, North-east Yorkshire, Thornton Dale, 10 Sep. 1960, Sledge), both now revised as O. phlebophora (Berk. & Broome) Sacc. Discussion

1. UV reaction

Lack of strongly pigmented encrustation on the ectal excipulum distinguishes O. alutacea and related taxa from most other Otidea species, except O. apophysata (Cooke & W. Phillips) Sacc. and O. platyspora Nannf., in which encrustation is absent or scarce respectively. This lack of encrustation is reflected in the UV reaction of the outer surface which in these taxa is most strikingly pale ochraceous buff under 264 nm or white 365 nm. The hymenium of the O. alutacea complex is also white under UV light, whereas in other unencrusted taxa it is darker (Hare Brown XLVI 17°), or Light Drab XLVI 17°. A white UV reaction from the hymenium is also characteristic of O. onotica, but the outer surface of that species is UV dark.
2. Suspected dynamism amongst related taxa in the *Otidea alutacea* complex

Amongst British collections of *O. alutacea* s.lato, the relative proportion of the four clades is still to be investigated when molecular data are available. However, the current study revealed that, in the 19th Century, 91.2% (n=34) of collections of all *alutacea* s.lato had spores 15.0–17.5 (–18.5) × (6.5–) 7.0–8.0 (–8.5) μm, and hence are representative of one the two larger-spored clades. Curiously, this proportion decreased to 58.6% (n=70) in the 20th Century and to 52.5 %, (n=40) since 2000. The reason of this change is unknown, but such a dynamism has also been reported in Britain for the two species of *Sarcoscypha*, *S. coccinea* (Gray) Boud. and *S. austriaca* (Beck ex Sacc.) Boud. (Butterfill & Spooner, 1995).

3. A morphological anomaly

An apparently teratological collection [K(M)145938] of an *Otidea* which macroscopically resembled *O. alutacea* but exhibited unusual, uniformly ovoid, small ascospores was made in 2006, in England. The ITS4 sequence of this specimen, banked at K, is identical to that of an Italian collection of the *O. alutacea* complex (no. 17, S-F257085, GenBank KM100069 (Ident. 100%), in Olariaga et al., 2015), as well as to K(M)81596, GenBank EU784381 (Ident. 99%), which form a well-supported clade. It is worth noting that a similar teratological collection, referred to *O. bufonia* based on molecular data, was previously reported by Olariaga et al. (loc. cit.: 208). The causes of these striking abnormalities are unknown. A description of K(M)145938 is given below.

**Apothecia** macroscopically as in the nominate variety, clustered, truncate, outer surface pale Fawn Color (XL13''') when fresh (from photograph), drying Warm Buff (XV17’d), hymenium Warm Buff to Tawny (XV13’’), when fresh (from photograph), drying Warm Buff (XV17’d). **Ectal excipulum** a textura subangularis, cells up to 20 μm diam., thin-walled, with short outgrowing chains of cells, pale yellow, unencrusted. **Medullary excipulum** a textura intricata, pale yellow when fresh. **Subhymenium** pale yellow when fresh, pale date-brown when dry, hyphae appearing hyaline sub-microscope. **Ascospores** smooth, biguttulate, uniseriate but irregularly arranged, ovoid, one end broad and bluntly rounded in outline, other end markedly narrowed, mostly with one large guttule or very rarely with two guttules, 12.0–13.5 × 7.5–8.5 μm (n=20). **Asci** 170 × 10.0 μm, 8-spored, arising from croziers. **Paraphyses** 2–3 μm wide at middle, 3–4 μm wide at apices, with pale yellowish inclusion. Fig. 8a, b.

**Specimens examined:** UK, England, Leicestershire, Leicester, 28 Nov. 2006, Rixon, K(M)145938.

**Conclusion**

The *O. alutacea* species complex is represented in Britain by taxa referable to at least four clades. One of the four clades (i.e. clade 1 of Olariaga et al., 2015) is well-delimited both morphologically and phylogenetically and is described here as a new variety, *O. alutacea* var. *parvispora*. The taxonomy of the remaining three clades (i.e. larger-spored clades 3b, and *s. stricto* of Olariaga et al., loc. cit., and another unnumbered smaller-spored clade newly recognised here

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**Fig. 8a** – *O. alutacea sensu lato*, with unusual ovoid spores, UK, England, Leicester, 28 Nov. 2006, Rixon, K(M)145938. Scale bar = 10 μm.

**Fig. 8b** – *Otidea alutacea sensu lato*, with unusual ovoid spores, K(M)145938. Photo: T.F. Hering.

**Fig. 8c** – *O. alutacea sensu lato*, with unusual ovoid spores, K(M)145938. Fragments from dried specimen, demonstrating the ochraceous hymenium with brown tone, photographed under daylight bulb, 6000K, with white balance adjusted. Photo: RBG, Kew.
based on British collections) remains unclear and is in need of further study. All four clades appear to be associated in Britain with broad-leaf trees, especially Fagus sylvatica, as also evident from specimens cited by OLARIAGA et al. (loc. cit.), but, at least among the two larger-spored clades, Fagus sylvatica rather than Quercus, is the most commonly recorded associate.

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References


BROCK P.M., DÖRING H. & BIDARTONDO M. 2009. — How to know un


