

## Introduction of Oxford ragwort, *Senecio squalidus* L. (Asteraceae), to the United Kingdom

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### ABSTRACT

The introduction of *Senecio squalidus* L. (Asteraceae) to Oxford, from Sicily, in the late 17th century and its subsequent spread through the United Kingdom, via the railway lines, is one of the best-documented introductions. Evidence for the introduction of *S. squalidus* to the Oxford Botanic Garden has come from herbarium and literature records, but despite the conclusions of previous investigators, there is no evidence from dated sources showing that *S. squalidus* was growing in the British Isles before 1700. Furthermore, evidence for an initial introduction to Oxford is limited, although if the records cited by George Druce are correct then it is likely that *S. chrysanthemifolius*, rather than *S. squalidus* was the initial introduction. Specimen-based evidence suggests that a more likely initial route of *S. squalidus* introduction was via Francisco Cupani and William Sherard (probably between 1700 and 1702), to the Duchess of Beaufort's garden at Badminton, with a later transfer of material to Oxford before Jacob Bobart's death in 1719.

KEYWORDS: Species introduction, Compositae, botanical history.

### INTRODUCTION

The introduction of *Senecio squalidus* L. (Asteraceae) to the Oxford Botanic Garden from Sicily in the late 17th century and its subsequent spread through the United Kingdom via the railway lines has caught the imagination of generations of British naturalists, horticulturists and botanists (Druce 1927b; Kent 1956). *Senecio squalidus* is now a common sight in most urban areas of the British Isles south of the Great Glen, and is still spreading (Kent 1956, 1957, 1960, 1963, 1964a, 1964b, 1964c, 1964d, 1966; Stace 1997). Moreover, it has had important influences on the evolution of the British *Senecio* flora (Abbott 1992).

Four botanists are associated with our knowledge of the introduction and spread of *Senecio squalidus* in the British Isles, John Sibthorp (1758–1796), James Edward Smith (1759–1828), George Claridge Druce (1850–1931) and Douglas Kent (1920–1998). In 1794, Sibthorp, in the preface to *Flora Oxoniensis* (p. 8), noted the occurrence of a plant on the walls of Oxford that he called "*Senecionis species*". It was only in 1800 that Smith identified this plant as *S. squalidus*, and in 1825, he indicated that the plant was "very plentiful on almost every wall in and about Oxford, where it was first noticed by Sir Joseph Banks" (p. 431). *Senecio squalidus* was thought to be native to Sicily and the occurrence on the walls due to naturalisation from the Garden (Smith 1825). In 1927, Druce, in *The Flora of Oxfordshire* (pp. 239–242), stated that *S. squalidus* was cultivated in the Oxford Botanic Garden before 1699, based on specimens in the Bobartian and Du Bois herbaria (OXF) and a description in Morison's *Plantarum Historiae Universalis Oxoniensis* (Morison 1699). Linnaeus visited Oxford in 1736 (Clokier 1964) and Walker (1833) states that Johann Jacob Dillenius (1684–1747), first Sherardian Professor of Botany, sent "seeds" of the material growing in the Garden to Linnaeus. However, Smith (1825) considers that there is no evidence to indicate whether "seeds" were collected from the Oxford Garden or from the walls of the city, a point reiterated by Baxter in 1834.

In a vivid description, Druce (1927b, p. 241) described the spread of the *Senecio squalidus* along the railway lines: "the vortex of air following the express train carries the fruits in its wake. I have seen them enter a railway-carriage window near Oxford and remain suspended in the air in the

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compartment until they found an exit at Tilehurst". In addition to the role of express trains in creating eddies to carry the "seed" and aid in dispersal, Druce (1927b, p. 241) asserts that the railway lines "furnished the plant with a replica of the lava-soils of its native home in Sicily".

More recently, knowledge of *Senecio squalidus* introduction and its diverse interactions with the British *Senecio* flora has stimulated intensive evolutionary research, including investigations of: (i) the origin of *S. vulgaris* L. var. *hibernicus* Syme via introgression of *S. squalidus* into *S. vulgaris* subsp. *vulgaris* (Abbott *et al.* 1992; but see Stace 1977); and (ii) the dual origin in Wales and Scotland of the allohexaploid species, *S. cambrensis* Rosser, between the diploid *S. squalidus* and the tetraploid *S. vulgaris* (Ashton & Abbott 1992; Lowe & Abbott 1996; Rosser 1955). *Senecio squalidus* also commonly hybridises with *S. viscosus* L., to form the sterile hybrid *S. subnebrodensis* Simk. (Benoit *et al.* 1975), and there is circumstantial evidence to suggest that this hybridisation has led to the spread of *S. viscosus* (Crisp & Jones 1978). Moreover, Abbott *et al.* (2000), extending the work of Crisp (1972), have argued that *S. squalidus* is itself a hybrid of the two Sicilian species, *S. aethnensis* Jan *ex* DC and *S. chrysanthemifolius* Poir. Furthermore, the importance of incompatibility allele evolution in this introduced species has been emphasised (Hiscock 2000, Brennan, pers. comm.).

The evolutionary impacts of the introduction of *Senecio squalidus* into the British Isles raise issues associated with the true identity of the plants and the number of "seeds" originally introduced, and whether there was more than one introduction. The purpose of the present paper is to assess critically the historical evidence for the introduction of *S. squalidus* into the United Kingdom.

#### TAXONOMY OF *SENECIO SQUALIDUS*

*Senecio squalidus* was first described by Linnaeus in 1753 as an annual, based on material sent to him from Oxford by Dillenius, although there is some dispute as to whether the material was collected from the Oxford Botanic Garden or the walls of the city (Baxter 1834; Smith 1825; Walker 1833). However, the taxonomy of this species in the United Kingdom is complicated by morphologically similar taxa in continental Europe, the potential for gene flow between these taxa and the large number of applied names (Alexander 1979).

*Senecio squalidus* is part of a group of morphologically variable *Senecio* taxa whose taxonomic limits have been variously interpreted over the past 200 years (Alexander 1979; Arcangeli 1894; Chater & Walters 1976; de Candolle 1837; Fiori & Paoletti 1903–1904; Gussone 1843; Pignatti 1982; Pojero 1902; Tornabene 1890). Five names, in addition to *S. squalidus*, are associated with this problem: *S. aethnensis*, *S. chrysanthemifolius*, *S. incisus* (C. Presl) C. Presl, *S. siculus* All. and *S. rupestris* Waldst. & Kit. The most recent treatment of the European *Senecio* species in Section *Senecio* recognises three of these species, *S. squalidus* (syn. *S. rupestris*), *S. aethnensis* and *S. chrysanthemifolius*; *S. incisus* and *S. siculus* were not considered (Alexander 1979). Chater & Walters (1976), in *Flora Europaea*, recognise *S. aethnensis* and *S. squalidus* as species, and place *S. chrysanthemifolius* into synonymy under *S. siculus*. However, Chater & Walters (1976) emphasised that the distinction between the three species is complicated by the occurrence of *S. incisus*, which is identified as a potential hybrid between *S. aethnensis* and *S. siculus* (syn. *S. chrysanthemifolius*), at intermediate altitudes (500–1500 m) on the slopes of Mt Etna. The Central European *S. rupestris* is considered similar to, but morphologically less variable than, *S. squalidus*. Pignatti (1982), in *Flora d'Italia*, recognised on Mt Etna a single morphologically variable *S. aethnensis*, which shows distinct altitudinal patterns, with leaf dissection of individual plants decreasing from the base to the summit of the volcano (Buscalioni & Muscatello 1909). This pattern of variation was recognised as three species by Ronsisvalle (1968): *S. aethnensis*, *S. incisus* and *S. chrysanthemifolius*. Furthermore, Pignatti (1982) recognised *S. rupestris* and *S. siculus* as separate species, the former being synonymous with *S. squalidus sensu* Chater & Walters (1976). Earlier studies (e.g., Baxter 1834; Smith 1825) placed *S. chrysanthemifolius* into synonymy with *S. squalidus*. Similar nomenclatural complexities are found in the application of pre-Linnaean polynomials. Indeed, if one considers the numbers of polynomials applied to *S. squalidus* and its presumed close relatives, the problem of taxon delimitation pre-dates Linnaeus (Table 1). The taxonomy used in this paper is that of Alexander (1979), where three species are

recognised: *S. aethnensis*, *S. chrysanthemifolius* and *S. squalidus* (syn. *S. incisus*), which may most effectively be separated by a combination of leaf dissection and inflorescence size characters (Abbott *et al.* 2000; Crisp 1972).

Intraspecific variation in *Senecio squalidus* has been described in the United Kingdom, Continental Europe and North Africa. Druce (1897, 1905, 1923) described three intraspecific taxa using the illegitimate names, *S. squalidus* L. forma *grandiflorus* Druce, *S. squalidus* var./forma *subinteger* Druce and *S. squalidus* var. *leiocarpus* Druce. In contrast, Alexander (1979) recognised three subspecies, subsp. *squalidus* (from south and east Europe and North Africa), subsp. *aurasiacus* (Batt. & Trab.) Alexander (restricted to Algeria and Sicily) and subsp. *araneosus* (Emb. & Maire) Alexander (endemic to Morocco).

Crisp (1972) suggested that *Senecio squalidus*, introduced into the United Kingdom, was collected from *S. incisus* populations on the slopes of Mt Etna, and following a century of cultivation in the Oxford Botanic Garden, derivatives of this material escaped from the Garden and rapidly colonised the United Kingdom. However, Smith (1825) emphasised that the U.K. material does not have the same range of morphological variation as that found on Sicily. Abbott *et al.* (2000), using morphometric and allozyme analyses of United Kingdom *S. squalidus* populations, showed that they closely resemble samples from the hybrid swarms between *S. aethnensis* and *S. chrysanthemifolius* and produce phenotypes that are intermediate in leaf shape and capitulum size between the two putative parental taxa. These data have led to the proposal that U.K. *S. squalidus* is a diploid hybrid that has originated allopatrically through stabilisation of hybrid material introduced from Mt Etna. Furthermore, the reduced genetic variation of the U.K. material compared with the Sicilian material suggests that only a small population of material was introduced into the United Kingdom (Abbott *et al.* 2000).

#### EARLY RECORDS OF *SENECIO SQUALIDUS* IN UNITED KINGDOM

Druce (1927b) provides the earliest account of the introduction of *S. squalidus* to the Oxford Botanic Garden. Central to Druce's arguments are descriptions of *Jacobaea Sicula Chrysanthemi facie* in Morison (1699, p. 109) and herbarium collections made by Bobart and deposited in the Fielding-Druce Herbarium (**OXF**). Druce (1927b) states:

“We know *squalidus* was cultivated in the Oxford Physick Garden before 1699, for Bobart (Hist. Ox. 109, 1699) says ‘*Perennis est planta* (most British authorities wrongly term it annual) *hyememque facile sustinens. Ad Catanam et Taurominium frequens nascitur*’, and of still earlier date are Bobart's specimens in his *Hortus Siccus*, and from a specimen in Herb. Dubois labelled *Jacobaea aetnea glauco folio* from Mr Bobart about 1690” (p. 241).

The history recorded by Kent (1956) is derived directly from Druce's (1927b) account, stating:

“*Senecio squalidus* L. was cultivated in the Oxford Botanic Garden at least 265 years ago, and early dried specimens from there are preserved in Hb. Du Bois (Oxford) and Hb. Sloane (British Museum) under the name ‘*Jacobaea aetnea glauco folio*’” (p. 115).

Since published information regarding the earliest records of *Senecio squalidus* in the United Kingdom appears to be limited to a description in Morison (1699) and herbarium specimens collected by Bobart in the Du Bois (**OXF**) and Sloane (**BM**) Herbaria and in Bobart's *Hortus Siccus* (**OXF**), it is necessary to critically evaluate these records. Evaluation of the earliest records of *S. squalidus* introduction into the United Kingdom is severely hampered by the fate of the Oxford Botanic Garden records. Turner (1835, p. ix) alludes to the destruction of Sibthorp's papers, and probably those of earlier botanists associated with the Garden, during the period when George Williams was Professor of Botany (1795–1834). Furthermore, Mr George Baker (*Horti Praefectus* Oxford University Botanic Garden, 1888–1942) destroyed records associated with the Oxford Botanic Gardens, during coal rationing, in 1942 (Allen & Walker 1995, p. 65). However, the extent of the records destroyed in 1942 is unknown since Druce (1927b), and all earlier workers on *S. squalidus*, make no mention of them. This implies a) that they were unaware of the existence of such records or b) that only those records now extant in the Plant Sciences Library (Oxford), the Sloane Collection (British Library) and the Sherard Collection (Royal Society of

TABLE 1. PRE-LINNAEAN POLYNOMIALS<sup>1</sup> APPLIED TO *SENECIO AETHNENSIS*, *S. SQUALIDUS* AND *S. CHRYSANTHEMIFOLIUS*

Binomial	Polynomial	Reference <sup>2</sup>	
<i>S. aethnensis</i> Jan ex DC	<i>Jacobaea aetnea, persicifolia angustiori</i>	Cupani (1696, p. 102)	
	<i>Jacobaea aetnea, glastifolio, leviter dentate, umbellifera</i> <sup>3</sup>	Cupani (1696, p. 102)	
	<i>Jacobaea sicula glasti folio</i> <sup>4</sup>	Tournefort (1700, p. 486)	
	<i>Jacobaea aetnea, Persicifolio crasso, glauco</i>	Cupani (1807, t. 168)	
	<i>Jacobaea orinos, latifolio, Isatidis sativi folio laeviter dentate Etensis</i>	Cupani (1713, f. 195), Cupani (1807, t. 161)	
	<i>Jacobaea emica Isatidis folio molli ac madido, flore medio albo, medio luteo</i>	Cupani (1807, t. 160)	
	<i>Jacobaea Aetnea, Isatidis folio, leviter dentate, umbellifera</i>	Cupani (1696, p. 102)	
	<i>Jacobaea Isatidis folio, Aetnensis</i>	Ray (1704, p. 179) with reference to Cupani	
	<i>Solidago Isatidis folio</i>	Vaillant (1720, p. 293) <sup>8</sup>	
	<i>Hieracium montanum Conyza aut Dentillaria folio glabro ex monte Centisio</i> <sup>5</sup>	Boccone <i>Hortus Siccus</i> , on Sherard 5372 ( <b>OXF</b> )	
	<i>Hieracium larifolium montanum folio Conyza Monspesublamae majoris flore luteo</i>	Boccone on Sherard 5372 ( <b>OXF</b> )	
	<i>S. squalidus</i> L.	<i>Jacobaea aetnea, foliis rigidulis, venosis, laciniatis, crispis</i>	Cupani (1696, p. 102)
		<i>Jacobaea aetnea, folio glauco laciniato</i>	Tournefort herbarium ( <b>P</b> ) in Gussone (1843)
		<i>Jacobaea chrysanthemii cretici folio</i>	Tournefort herbarium ( <b>P</b> ) in Gussone (1843)
		<i>Jacobaea aemica, Chrysanthemii segetum cretici folio, umbellifera</i>	Cupani (1713, 2, t. 139, f. 2) in Gussone (1843)
		<i>Jacobaea emica, Chrysanthemii segetum cretici folio, umbellifera</i>	Cupani (1713, f. 48), Cupani (1807, t. 167)
		<i>Jacobaea aetnensis, folio oblongo laciniato nervoso</i> <sup>6</sup>	Cupani (1713, f. 195), Cupani (1807, t. 161)
<i>Jacobaea laciniata, cornu cervi forellae modo</i> <sup>6</sup>		Cupani (1807, t. 160)	
<i>Jacobaea Aetnea glauco folio</i>		Du Bois herbarium and Sherard 5310 ( <b>OXF</b> )	
<i>Jacobaea minor, Abrotani folio</i>		Barrelier (1714, p. 97, t. 262, fig. II) <sup>7</sup>	
<i>Jacobaea Aetnensis coronopifolio</i>		Ray (1704, p. 178) with reference to Cupani	
<i>Jacobaea nebrodensis, fruticosa, oblongo folio, infernè ac supernè candido, sinuato</i>		Cupani (1696, p. 102)	
<i>Jacobaea Montana major, ab alis sursum semiperfoliata, laciniata, crasso folio</i>		Cupani (1697, p. 41)	
<i>Jacobaea Africana frutescens, folio longo et glauco</i>		Ray (1704, p. 174)	
<i>S. chrysanthemifolius</i> Poir. <i>Jacobaea Sicula Chrysanthemii facie</i>	<i>Jacobaea chrysanthemii cretici folio glauco</i> <sup>3</sup>	Boccone (1674, p. 66, t. 36)	
	<i>Jacobaea tenuissime laciniata, Bupththalmi flore</i>	Tournefort (1700, p. 486)	
	<i>Jacobaea Chrysanthemii facie</i>	Tournefort (1700, p. 486)	
	<i>Senecio minor atilis, umbellatus, stoebes foliis</i>	<i>Jacobaea minor stoebes foliis, umbellata</i>	Boccone herbarium ( <b>P</b> ) in Bonnet (1883), Cupani (1696, p. 102), Cupani (1807, t. 162)
		<i>Jacobaea minor stoebes foliis, umbellata</i>	Cupani (1713, f. 105), Cupani (1807, t. 158)
		<i>Jacobaea Emica, Chrysanthemii segetum lobatum folio</i>	Cupani (1807, t. 158)
			Cupani (1694, p. 39)

- <sup>1</sup> Tita (1713, p. 95) cites *Jacobaea Aetnica glauco folio cornuo cervi divisura* as a synonym of *Jacobaea sicula glauco folio* with reference to Tournefort (1700, p. 486). No such name appears in Tournefort, the closest being *Jacobaea sicula glasti folio*. However, Tita's description does not fit typical *Senecio aethnensis*, and is closer to the *aethnensis*-extreme of *S. incisus*. Tita (1713, p. 95) also cites *Jacobaea Aetnea glauco folio scisso* from the *Hortus Catholicus*, which falls within the morphological range of *S. incisus*.
- <sup>2</sup> References to Cupani (1713, 1807) refer to the copies in the Library of the Linnean Society of London, except where otherwise stated. The publishing history of Cupani's *Pamphyton* is complex, and no complete single copy exists (Priolo, 1996). References to the *Pamphyton* in Gussone (1843) refer to the most complete copy of the work, which is located in the *Biblioteca Centrale della Regione Siciliana* in Palermo.
- <sup>3</sup> Specimens 5317 and 5317<sub>2</sub> in the Sherard herbarium (**OXF**) bearing this name fall in the morphological range of United Kingdom *Senecio squalidus*.
- <sup>4</sup> Tab. 421, f. 7 in Plukenet (1705), which bears this name, falls in the morphological range of United Kingdom *Senecio squalidus*.
- <sup>5</sup> Mt. Cenisio is on the Italian/French Border, although since *Senecio aethnensis* is considered to be endemic to Sicily the implication that the specimen came from Mt. Cenisio may be in error.
- <sup>6</sup> Tomabene (1890, p. 518) equates these polynomials with *Senecio gallicus* Chaix.
- <sup>7</sup> Gussone (1843) gives the name *Jacobaea sicula, Chrysanthemi cretici folio* for this illustration and places it in the range of *Senecio chrysanthemifolius*, although this polynomial does not appear in Barrelier (1714).
- <sup>8</sup> Vaillant (1720, p. 297) cites two additional polynomials, *Jacobaea Aetnensis, folia minus secto, glauco* and *Jacobaea Aetnensis, Coronopifolio raddiis florum fistulosis*, which appear to match *Senecio aethnensis* and *S. squalidus* respectively. However, no specimens bearing these polynomials have been located.

London) existed or c) that the destroyed records contained no significant information pertaining to *S. squalidus*. A search of the archives of the University of Oxford and Magdalen College (owners of the Oxford Botanic Garden site) has revealed no information of relevance to the history of *S. squalidus*.

#### HERBARIUM MATERIAL

Jacob Bobart the Younger (1641–1719), was the youngest son of Jacob Bobart the Elder (1599–1680), and succeeded his father as *Horti Praefectus* in Oxford, and on the death of Robert Morison lectured as botany professor in the University, although he does not appear to have been officially appointed to the latter position (Vines & Druce 1914). Bobart is most widely known for his completion of the third part of *Plantarum Historiae Universalis Oxoniensis* (Morison 1699), following Morison's death. Bobart left a herbarium (*Hortus Siccus*), which comprises approximately 2,000 undated specimens collected mainly from the Botanic Garden (Clokier 1964). However, a search of the whole of the *Hortus Siccus* has failed to locate the specimen of *Senecio squalidus* cited by Druce in 1927. Furthermore, no specimens corresponding to the polynomial names of *S. squalidus* are cited by Bobart in the table of contents at the start of the *Hortus Siccus* and no material appears to be missing from the collection.

Druce (1927b) may have confused the *Hortus Siccus* and the Morisonian herbarium. The latter comprises approximately 5,000 sheets collected together, primarily by Bobart, for the preparation of third part of Morison's *magnum opus* (Vines & Druce 1914). There is a single sheet of sterile, scrappy material in this collection labelled "*Jacobaea Sicula Chrysanthemi facie* Boccone" in Bobart's hand, and doubtfully identified as *Senecio squalidus* by Vines & Druce (1914, p. 88). Clokier (1964) has argued that where Bobart cites a single author it is difficult to tell whether the author sent the specimen or not, although she states that Boccone sent specimens to Bobart, including "seeds" of *S. squalidus* (Clokier 1964, p. 134). The Morisonian specimen appears to be morphologically very similar to specimens in the Sherardian herbarium (labelled "*Jacobaea Chrysanthemi* Boc. Ic." [Francesco Cupani's hand], "Entr." [John Ray's hand, indicating that this specimen was seen during the preparation of Ray (1704)] and "5323" [William Baxter's hand], right side of a mixed sheet), the Du Bois herbarium (labelled "*Jacobaea Sicula Chrysanthemi facie* Boccone Ray Hist. Vol. 1 p. 286. From Mr Jacob Bobart of Oxford" [Du Bois' hand]) and the Duchess of Beaufort's herbarium (Sloane herbarium, **BM**, HS 140, f. 58, top of page; labelled "*Jacobaea Sicula Chrysanthemi facie* Boccone v. pag. 109" [Duchess of Beaufort's amanuensis; Dandy (1958)]). All of these specimens fit the description of *S. chrysanthemifolius*.

Bobart collected material gathered in, or assumed to be from, the Oxford Botanic Garden and sent it to prominent botanists of the early 18th Century, including William Sherard (**OXF**), Sir Arthur Rawdon (Sloane herbarium, HS 301, **BM**) and Charles Du Bois (**OXF**). In addition, he sent plants and seeds to the gardens of Mary Somerset, Duchess of Beaufort (1630?–1714) at Badminton, Gloucestershire, which he visited in 1693 (Dandy 1958), and to Chelsea.

Five specimens in the Du Bois herbarium are annotated as *Senecio squalidus* by Druce, but only one (labelled "*Jacobaea Sicula Chrysanthemi facie* Boccone Ray Hist. Vol. 1 p. 286. From Mr Jacob Bobart of Oxford") is cited by Druce (1927a) in his account of the British plants in this collection. A second specimen labelled "*Jacobaea Sicula Chrysanthemi facie* Bocc. Plant. Rar. *ex sementi* D. Dubois [William Stonestreet's hand]. From Mr Stonestreet [Du Bois' hand]", appears to have been raised by Rev. William Stonestreet (d. 1716) from seeds sent by Charles Du Bois. A specimen from the Du Bois herbarium labelled "*Jacobaea aetnea glauco folio* [Bobart's hand]. Ragwort from Mount Etna with hoary leaves. From Mr Jacob Bobart of Oxford [Du Bois' hand]" was used by Druce (1927b) to indicate that *S. squalidus* was growing in the Botanic Garden pre-1690. However, there is nothing on the sheet to indicate the date of collection. Druce (1927a) stated that the earliest specimens in the Du Bois herbarium were made in 1690, although Clokier (1964) states that the sheets in the Du Bois herbarium are dated from 1698 to 1724 (an annotation in the **OXF** copy of Clokier places the earliest date as 1697). The polynomial name does not appear in Ray (1686, 1688, 1704), Plukenet (1696, 1700, 1705) or Cupani (1696, 1697, 1713), although one sheet (Sherard 5310) in the Sherardian herbarium (**OXF**) does bear this name. This sheet is morphologically distinct from the sheet in the Du Bois herbarium, and corresponds to the *S. aethnensis* end of the morphological range of *S. incisus*. In addition, the Sherard sheet bears the polynomial names *Jacobaea nebrodensis*, *fruticosa*, *oblongo folio*, *infernè ac supernè candido*,

*sinuato* (Cupani 1696, p. 102), *Jacobaea Montana major, ab alis sursum semiperfoliata, laciniata, crasso folio* (Cupani 1697, p. 41) and *Jacobaea Africana frutescens, folio longo et glauco* (Ray 1704, p. 174). Furthermore, this sheet also includes the phrase “*ex semina a P. Cupani misso, succravit in Horto Badminton*” [Sherard’s hand], indicating that this material was collected from the Duchess of Beaufort’s Garden from “seed” collected by Cupani (identical material is found in the Duchess of Beaufort’s herbarium, Sloane herbarium, **BM**, HS 135, f. 72, top of page). The morphological dissimilarity between the specimens in the Sherard and Du Bois collections raises the possibility that Bobart collected material from the Badminton material, and that the “seed” was of hybrid origin. Two specimens in the Du Bois herbarium come from the Duchess of Beaufort’s garden (“*Jacobaea folio glauco Aetnea*, Cupani. From the Dutchess of Beauforts Garden at Badminton” [Du Bois’ hand] and “*Jacobaea* in Cupani. One of Dr Sherards Badminton Specimens” [Du Bois’ hand]). These three morphologically diverse specimens, collected from the Badminton Garden, correspond to the range of variation found in *S. incisus*. Thus, there were plants morphologically similar to *S. squalidus* and *S. chrysanthemifolius* growing at Badminton.

William Sherard (1658–1728) was one of the most outstanding botanists of his day, and maintained friendships with most major botanists of the late 17th and early 18th Centuries, including Bobart, Tournefort, Ray and Sloane (Clokier 1964). For 18 months, between 1700 and 1702, he was engaged as a tutor to the grandson of the Dowager Duchess of Beaufort at Badminton, before being engaged as Consul to Smyrna in present-day Turkey (Jackson 1874). During his period at Badminton, Sherard introduced at least 1,500 plants (Turner 1835, p. 33). Sherard’s herbarium, described by Smith as “perhaps, except that of Linnaeus, the most ample, authentic, and valuable botanical record in the world” (cited in Dandy 1958, p. 202), comprises over 14,000 sheets, the majority of which are still identified by pre-Linnaean Latin polynomials. Four additional sheets in the Sherard collection fall within the morphological range of *Senecio squalidus*, although there is no indication of where these specimens were collected. All of these sheets have been labelled or annotated by Dillenius, although Sherard 5317<sub>2</sub> also bears one of Sherard’s original labels.

#### LITERATURE

Robert Morison (1620–1683), Professor of Botany in Oxford, fought the Royalist cause during the Civil War and fled to France. Following the restoration of Charles II he was made senior King’s Physician, King’s Botanist and superintendent of all the royal gardens. Morison is most widely known for his system of classification and the work *Plantarum Historiae Universalis Oxoniensis* that was to have appeared in three parts. However, only Part 2 appeared during his lifetime (Morison 1680), Part 3 was completed by Bobart (Morison 1699) and Part 1 remains unfinished. However, Morison’s reputation has been marred by the disagreements he had with John Ray (Raven 1942) and his own refusal to acknowledge earlier botanists in the formulation of his classification system (Boulger 1909, Vines 1913).

Druce (1927b) cited Morison (1699) as evidence that *Senecio squalidus* was growing in the Oxford Botanic Garden pre-1699 based on the observation that the plant over-winters as a perennial. The same over-wintering observation was made by Ray (1686, p. 286): “*Perpetua est planta, hyménque facîle sustinens, ad Catanam & Tauromenium frequens*”. Clokier (1964, p. 54) repeats this assertion stating “Bobart undoubtedly grew it in the Garden and says of it that it easily stands the winter”. However, there is strong evidence that Morison’s description, and the associated plate, were copied from Boccone (1674), whilst that of Ray (1686) was modified from the same author. Furthermore, there is no dated herbarium specimen, collected in the Oxford Botanic Gardens, from this period in the **OXF** or **BM** collections. These data, taken together, indicate that *S. squalidus* was not necessarily growing in Oxford pre-1699.

Both Morison (1699) and Ray (1686) cite work by the Sicilian botanist Paulo Boccone (1633–1703/4) published in 1674. Comparison of the description of *Jacobaea Sicula Chrysanthemi facie* in Boccone (1674, pp. 66–67) and that in Morison (1699, p. 109, No. 15) show that they are identical except for the insertion of the phrase “*Hujus datur varietas humilior, Schol. Bot. Per.*” in Morison (1699). This phrase is a reference to W.S.A. (1689), in which *Jacobaea Sicula Chrysanthemi facie* is listed as growing in the Paris Botanic Garden in 1687–1688, along with another plant described as *Jacobaea Sicula Chrysanthemi faci humilior*. W.S.A. (1689) is usually attributed wrongly to an unknown botanist, Simon Wharton Anglus. However, most 18th Century

and modern botanists consider W.S.A. to refer to William Sherard (Clokier 1964, Jackson 1874). The description in Ray (1686) is a modified version of Boccone (1674), with no additional information that indicates Ray saw the living plant.

Comparison of the illustration in Boccone (1674, Tab. 36) with that in Morison (1699, Sect. 7, Tab. 12) shows that the latter is a poorer, stylised, reversed copy of the former. At least one other description and illustration in Morison is copied from Boccone; *Jacobaea multifida umbellata annua* (*Senecio delphinifolius* Vahl) in Morison (Section 7, Tab. 12) is copied from Boccone (Tab. 51). Numerous examples exist of the Boccone's text being copied exactly in Morison; e.g., *Pastinaca Oenanthes folio* [*Daucus carota* L. subsp. *drepanensis* (Arcang.) Heywood], *Jacobaea pumila Gallica* (*Senecio gallicus* Vill.) and *Lithospermum umbellatum latifolium* [*Lithospermum rosmarinifolia* (Ten.) I. M. Johnston]. With reference to Morison (1680), both Pulteney (1790, p. 310) and Vines & Druce (1914, p. xliii) state that many of the illustrations were copied from other authors.

Paulo Boccone, botanist to the Grand Duke of Tuscany and Professor of Botany at Padua, visited England and, on 7 May 1673, attended a meeting of the Royal Society (Birch 1757, p. 87). Robert Morison edited Boccone (1674), after Boccone requested Charles Hatton, one of Morison's patrons, to send the manuscript to him (Henry 1975). However, Morison found the final seven of the 52 plates to be very inaccurate and had them redrawn from dried material at Charles Hatton's expense (Morison's dedication in Boccone 1674).

Clokier (1964) states Boccone sent *Senecio squalidus* "seed" material to Bobart in Oxford, although the source of her information is unclear. If Boccone were the source of plants grown in Oxford then it would appear that the initial introduction was *S. chrysanthemifolius*. Boccone's herbarium was studied by Bonnet (1883), and material described as *Jacobaea Sicula Chrysanthemi facie*, and associated with Tab. 36 in Boccone (1674), was identified as *S. chrysanthemifolius*, the binomial that has been attached to the polynomial by all subsequent authors (e.g. Bivona-Bernardi 1807; de Candolle 1837). Furthermore, all materials in the Sherard, Du Bois and Sloane herbaria identified by this polynomial are *S. chrysanthemifolius*. In addition, Boccone (1674) stated that *Jacobaea Sicula Chrysanthemi facie* occurred frequently between Catania and Tauromina (<300 m asl). This would support the conclusion that the material referred to is *S. chrysanthemifolius*, since, according to Crisp (1972), *S. chrysanthemifolius* occurs to approximately 1000 m asl and *S. aethnensis* from approximately 1600–2600 m asl, with the hybrid swarm between the two species occurring at 1300 ± 300 m asl on the slopes of Mt Etna.

The greatest diversity of Sicilian *Senecio* species in cultivation at the end of the 17th Century was growing in the *Hortus Catholicus*, the garden that Guisepppe del Bosca, Principe della Cattolica, established at Misilmeri, Palermo, in 1692, under the direction of Francisco Cupani (1657–1711), a Sicilian physician, and pupil of Boccone (Cupani 1696, 1697, 1713, 1807). Of the 28 pre-Linnaean polynomials applied to *S. aethnensis*, *S. chrysanthemifolius* and *S. squalidus*, 19 are first found in works by Cupani and the plants bearing these polynomials were in cultivation at Misilmeri. In contrast, the most frequent name among other European botanists was Boccone's *Jacobaea Sicula Chrysanthemi facie*. Cupani was a correspondent of Sherard (Sherard Collection, SH121–SH137, letters dated between 1696 and 1702), and "seeds" were sent to him at Badminton (specimens in the Sherardian, Du Bois and Sloane herbaria). These documents, together with the diversity of material in cultivation at Badminton, suggest that Cupani was the source of the original material grown in the United Kingdom, later described as *S. squalidus* by Linnaeus (1753).

#### CONCLUSIONS

Literature citations by English authors of the late 17th century refer to *Senecio chrysanthemifolius* [as *Jacobaea Sicula Chrysanthemi facie*; Morison 1699, Ray 1686], although there is no evidence that the plant was growing in United Kingdom during this period. Furthermore, the specimen of *Jacobaea Sicula Chrysanthemi facie* in the Morisonian herbarium appears to be a duplicate of a specimen in the Sherardian herbarium. In contrast, there is evidence that *S. chrysanthemifolius* was growing in the Paris Botanic Garden between 1686 and 1688 (Wharton 1689), and it is only in the works of Cupani (1696, 1697, 1713, 1807) that plants morphologically similar to United Kingdom

*S. squalidus* are described, many of which were growing in the garden at Misilmeri, Sicily. Specimens in both **OXF** and the Sloane herbarium (**BM**) indicate that material morphologically similar to United Kingdom *S. squalidus* was growing at Badminton in the early 18th Century and that at least some of the material was raised from seed supplied by Cupani, most probably via Sherard. Thus, it appears likely that Cupani was the original source of material introduced to Badminton. In addition, evidence from the Sloane herbarium indicates that the Duchess was also growing *S. chrysanthemifolius* in her garden. Until the death of the Duchess of Beaufort in 1714, Bobart appears to have had regular contact with the Badminton garden (Bobart 1699, Dandy 1958), which would be a more likely source of *S. squalidus* in Oxford than via Boccone, as proposed by Clokie (1964). However, introductions that involve Tournefort at the Botanic Garden in Paris or Boccone cannot be ruled out. If Cupani was the source of *S. squalidus* introduced to the United Kingdom, the identity of the original introduction is likely to remain a source of speculation since numerous morphological forms of *S. aethnensis*, *S. chrysanthemifolius* and *S. squalidus* were being grown in the *Hortus Catholicus*. Furthermore, since material matching both *S. squalidus* and *S. chrysanthemifolius* was growing in the Badminton Garden, the precise identity of the material introduced to the Oxford Botanic Garden is likely to remain a mystery, although Abbott *et al.* (2000) provide evidence that the material that colonised the United Kingdom is of hybrid origin between *S. aethnensis* and *S. chrysanthemifolius*.

Druce (1927b, p. 241) states that at "... Badminton, on the garden walls, I noticed it [*Senecio squalidus*] in 1909, but there it may have been unintentionally introduced from Oxford by Bobart, who about 1700 planted many shrubs and plants for the Duchess of Beaufort". In the light of the evidence provided in the present paper, this is a perceptive observation, except that the gardens at Badminton are likely to have been the source of the plants grown by Bobart in Oxford.

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## NOTES

1. The phrase 'Oxford Botanic Garden' will be used throughout this paper as a synonym of the 'Oxford Physic Garden', except in the case of quotations.
2. The earliest dated herbarium specimen of *Senecio squalidus* (*P. Gisbourne s.n.*) was collected in Oxford in 1792 (CGE) and labelled '*Senecio muralis* Curt.', a name not found in the International Plant Name Index.
3. One specimen in the Sherard herbarium (OXF) is labelled '45 *Senecio squalidus*' in Sibthorp's hand. This is a specimen of *Senecio erucifolius* L., which in terms of superficial leaf morphology appears similar to *S. chrysanthemifolius*. Hermia Clokie annotated this specimen as '?from Hort Oxon.'. If this specimen represents Sibthorp's concept of *S. squalidus* it may explain why he did not recognise the material growing on the walls of Oxford in 1794 as *S. squalidus*. However, Sibthorp does describe *S. erucifolius* in *Flora Oxoniensis* (p. 253). In a manuscript catalogue of the plants in Oxford Botanic Garden, dated 1780, by Humphrey Sibthorp, John Sibthorp's father, no mention is made of *S. squalidus* (MS Sherard 213, Plant Sciences Library).
4. There is no mention of *Senecio squalidus* in a manuscript catalogue of the Oxford Botanic Garden prepared by Jacob Bobart in c. 1666 (MS Sherard 30, Plant Sciences Library), and similarly *S. squalidus* is not mentioned in a manuscript list of plants seen in the Duke of Beaufort's Garden at Badminton on 30 September 1699 (MS Sherard 36, Plant Sciences Library).
5. Specimen Sherard 5323 appears to have been sent to Sherard by Francisco Cupani. Part of this material may have been sent to Bobart, and is now included in the Morisonian herbarium, since it is known that Sherard sent much material to Bobart (Sherard Collection, SH105, dated 18 June 1703). Furthermore, this specimen must have been collected before 1704, since it has been annotated by Ray.
6. There is a second specimen in the Duchess of Beaufort's herbarium (HS 134, f.21, top of page) bearing this name. However, it is not possible to confirm the identity of the material since it is a sterile specimen of rosette leaves. This specimen is dated 'Chelsea 1714', although Dandy (1958, p. 211) states that the volumes of the Duchess' herbarium were prepared after her death (7 January 1714) and that the collection appears to have continued after this time.
7. The reference refers to Ray (1686). It is unclear if this citation implies that the specimen was added to the Du Bois herbarium before the publication of Morison (1699). Furthermore, there is nothing to indicate that the specimen was collected in Oxford, other than Jacob Bobart supplying the material to Du Bois. Clokie (1964) emphasises that it is often difficult to tell from where Bobart obtained his specimens. The leaf morphology of this specimen is similar to that of the specimen found under the same polynomial in the Morisonian herbarium. The reference to Ray (1686) may have been used by Druce (1927b) to support his conclusion that material in the Du Bois herbarium was collected pre-1690.
8. Letter from Sherard to Richardson dated 1 March 1701; '... on account of the noble gardens her Grace, my Lady Duchesse, has; and truly in a few years they will out-do any yet in Europe; being furnish'd with all conveniences imaginable, and a good stock of plants, to which I have added above fifteen hundred, and shall daily procure more from my correspondents abroad'. Sherard makes no mention of *Senecio squalidus* in a manuscript list of plants he saw in the garden at Badminton in 1700 (MS Sherard 174, f.10v–f. 11v, Plant Sciences Library).

9. A search of Cupani's *Hortus Siccus*, located in the herbarium of the Department of Botany, University of Catania (<http://www.dipbot.unict.it/Erbario/cupani/index.html>), failed to reveal any specimens that could be referred to as *Senecio aethnensis*, *S. chrysanthemifolius* or *S. squalidus*.
10. Cupani is also thought to have been the Sicilian source of the first United Kingdom introduction of *Lathyrus odoratus* L. (Fabaceae) to the Reverend Robert Uvedale's garden at Enfield in 1699 (Unwin 1952).

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