The Long Term Housing, Maintenance and Scientific Curation of the National Fruit Collections

Defra Project code GC0147

Annual Report 2023/24

Appendix 1

Assessment of the NFC 4 cherry collection

Background

During the period of 2017-2020 the NFC cherry collection was repropagated. Propagating material was collected from the NFC 3 cherry collection and budded onto Colt rootstock in 2017 with trees subsequently grown on and planted out as cherry NFC 4 in early 2020. To confirm that all accessions were correctly propagated and planted, SSR analysis was carried out in order to compare between the new NFC 4 trees and their predecessors in the NFC 3 collection.

Prior to repropagation, a number of suspected duplications had been identified. These were originally considered by curators at Imperial College Wye and were tested using SSR markers at East Malling (although the data were neither published nor placed on file in the NFC database). Consequently, these analyses were repeated in advance of the propagation (data are available at https://doi.org/10.3390/plants10061243) and a series of accessions were removed from the propagation process based on the findings (as detailed below).

Following repropagation, samples were collected from the NFC 3 trees in order to provide a preliminary dataset against which to compare the newly propagated trees. In the interests of efficiency, and on the basis that only one tree will have generally been used for propagation, this initial analysis was carried out on a single tree per accession. Again, these preliminary data and a description of the methods used are available at https://doi.org/10.3390/plants10061243 where it was also noted that a number of either data handling or sampling errors appeared to be present in the dataset (based on odd matches or non-matching trees that were thought to be the same).

Subsequently, samples were analysed from the NFC 4 trees after they were planted out in their final positions. All available trees were sampled (i.e. both trees from each accession), noting that a few accessions required a second attempt at propagation and so were missed in the initial analysis. In an attempt to resolve the suspected errors in the preliminary dataset, 37 samples were also included from NFC 3 trees for which the data were deemed to be suspect.

All samples were analysed following the protocols in Ordidge *et al*. (Plants 2021, 10(6), 1243) although the cited Edge-Garza DNA extraction protocol was used in the second round of analysis since this allowed leaf samples to be collected directly onto extraction plates and was felt to be both more cost-efficient and potentially reduce handling errors (reducing the need to handle samples after field collection). Samples were analysed using the split version of Multiplex A as described for the later GB analysis in Ordidge *et al*. (Plants 2021, 10(6), 1243).

Fingerprint profiles were analysed and scored using Genemapper software. Where results were unclear or profiles were incomplete due to failed reactions, samples were re-analysed either from newly re-collected leaves, or from back-up samples collected at the time of the initial collection. Samples were also repeated in a number of instances where the initial finding was unclear or raised a query about the correctness of either the NFC 4 trees or the background (NFC 3) data. Following the analysis of repeated samples, profiles were judged to either match their counterpart in NFC 3 or were marked for further consideration.

One group of samples was accepted to be correct based on an off-set in the NFC 3 data. The samples in question were placed consecutively (with the exception of a small number that were missing or unresolvable) on a single plate in the NFC 3 analysis. Approximately 1/3 of them had been noted as either potential data or sample handling errors (as above) and the off-set was confirmed by a group of 26 technical replicates that were distributed amongst the samples. Data were consistently associated with the neighbouring well in the plate and this appeared to have been caused by a missing entry (at position D1). A further 35 samples were accepted to be correct based on this off-set after thoroughly checking the fingerprints. The remaining samples were deemed to be correct based on direct comparison. Judgements were supported by further consideration amongst known clonal duplicates and following consideration of matching profiles in the aligned European dataset (Ordidge *et al*. Plants 2021, 10(6), 1243) where necessary.

Summary of findings

Overall, 984 SSR profiles were generated for the purpose of signing off the NFC 4 collection. Approximately 300 were initially generated from the NFC 3 collection, with 37 biological replicates of these added alongside the NFC 4 samples, in order to provide background data for comparison. These were further complemented by a set of 91 profiles that had been generated prior to repropagation (and had been used to avoid including suspected duplicates within the repropagation process). A further 637 profiles were produced from the combination of newly propagated NFC 4 trees and the 'East Malling' (EM) block.

Of the repropagated trees, 549 out of 556 were deemed to be correct. These represented 276 accessions with 273 accessions being represented by two trees and three accessions existing as one tree only at the time of analysis. Four trees (representing two accessions) remain under investigation because of missing data. Of these two accessions, one would appear to be correct on the basis of the available data and the other would appear to potentially be false (seeming to identify with the 'Napoleon' clones). Both of these accessions are undergoing further analysis.

Three trees were deemed to be 'false' and in each case the incorrect tree was found to be 'Colt' rootstock (presumably having grown out as a result of a failed graft). In one of these cases, the tree is actually a replacement for a tree that was deemed correct but died after analysis. In all three cases, the second tree of the pair was found to be correct (and all three are undergoing further propagation).

SSR profiles were produced for 81 accessions in the 'East Malling' block. Since these were not part of the repropagation process the profiles were generally not replicated and only one tree per accession was analysed. Sixteen of these accessions were verified against prior data but the remainder are unreplicated.

A number of groups of profiles were found to be indistinguishable and these are taken to reveal further duplication in the collection. The following groups were deemed to be indistinguishable on the basis of SSR data and subsequent morphological comparison.

We would like to thank Edward Venison and Dr Deepti Angra for the production and analysis of SSR data. We would like to thank Dr Joan Morgan for further ongoing discussion of the groupings below and we would thank all previous curatorial staff at Brogdale for notes in the NFC database.

1974-098 Early Rivers, 1974-162 Klon 29, 2000-128 Alfheim and 2002-133 Unknown (accessed as Ursula Rivers)

1974-098 was previously deemed to agree with published descriptions of Early Rivers. Klon 29 is supposedly a *P. cerasus* from a variety trial and the similarity would suggest a historical propagation error. Alfheim is reputedly a sport of Early Rivers although no clear morphological differences could be seen. 2002-133 was suggested not to be true to the cultivar Ursula Rivers by Boskovic & Tobutt (Theor. Appl. Genet. 2001, 103:475-485) and similarity would suggest a correct identification – 1974-162, 2000-128 and 2002-133 should all be deaccessed (unless further evidence for value of the sport can be identified).

In addition, the following accessions were confirmed to match this group prior to repropagation and, since they were not repropagated, will be deaccessed on the release of NFC 3: 1927-029 Bauman's May A, 2002-139 Bauman's May B and 1974-212 Kastanka.

2007-028 Schneiders Spate Knorpelkirsche. 1948-468 Badacsonyi Orias, 1968-129 Magyar Porc Csereszyne, 1974-222 Thurn Taxis, 2002-150 Pointed Black, 2017-002 and Noire de Meched (ECPGR Reference 4)

This finding agrees with that from the alignment of ECPGR collections, where a larger group of accessions (including these) was also found to be indistinguishable. Schneiders Spate Knorpelkirsche appears to be the oldest name with provenance to 1881 and accessions of the same name were aligned from both Germany and Switzerland. The accession of Noire de Meched is nominated as an ECPGR standard – 1948-468, 1968-129, 1974-222 and 2002-150 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2002-115 Baker's Unknown.

Furthermore, the following accessions in the 'East Malling' block were also found to match this group and should be considered further: 2009-017 Noire de Meched and 2009-040 hybrid 'Dropmoreana No.1'.

1968-132 Noble, 1963-169 Turca, 1971-097 Di Pistoia, 1974-146 Durona Di Vignola and 2002-135 Black Tartarian (A.Bayley)

1968-132 had previously been deemed to match published descriptions for Noble. This finding also agrees with that from the alignment of ECPGR collections, where a larger group of accessions (including these) was also found to be indistinguishable. Noble appears to be the oldest name in the UK with provenance to 1899 and Noble has been nominated as an ECPGR standard (although NFC trees of the standard had not established and so were not included in this analysis) – 1963-169, 1971-097, 1974-146 and 2002-135 should be deaccessed.

In addition, the following accession in the 'East Malling' block was also found to match this group and should be considered further: 2010-024 Tardif di Vignola.

2002-058 Elton Heart and 1974-231 Srdcovka Preurodna

2002-058 had previously been deemed to match a published description of Elton Heart. This agrees with the ECPGR alignment of an accession under the latter name in the Czech Republic. Elton appears to be the original name, with provenance to the raiser and naming to 1831 – 1974-231 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and was held under a name documented to be synonymous with Elton Heart. Since it was not repropagated, it will be deaccessed on the release of NFC 3: 2002-118 White Elton.

1975-091 Noir de Guben, 1968-118 Judy's Fancy, 1974-229 Mramorovana and 2002-130 Edmonds Unknown

1975-091 had previously been deemed to match a published description of Noir de Guben which also has published provenance as a name to 1876. None of the other cultivar names have provenance in the NFC database – 1968-118, 1974-229 and 2002-130 should be deaccessed.

1984-089 Black Glory and 1968-142 S-6-10

Neither accession name has provenance in the NFC database – 1968-142 should be deaccessed.

2007-031 Grose Schwarze Knorpel, 1997-019 Grosse Schwarze Knorpel, 2002-074 Hooker's Black and 1974-209 Chlumecka Rana

2007-031 and 1997-019 were deemed to broadly agree with published descriptions of Grosse Schwarze Knorpel although there is recorded to be confusion in the name (with possible provenance to being of UK origin). 2007-031 was noted to have better flavour than 1997-019. The group was also aligned against a slightly larger group in the ECPGR data that included an accession under the name Grosse Schwarze Knorpel in Germany. 2002-074 was previously deemed to agree with a published description for Hooker's Black which Grubb referred to as a local Kent variety. 1974-209 was previously found to agree with a published description of Chlumecka Cerna (the name it arrived under) and the ECPGR group also contains an accession under that name in the Czech Republic – 1997-019, 2002-074 and 1974-209 should be deaccessed and naming considered further.

1973-342 Hedelfingen Riesenkirsche, 1974-210 Holovouska, 1982-045 Mary Jane and 2002-111 Windsor B

1973-342 had previously been deemed to match a published description of Hedelfingen Riesenkirsche. Hedelfingen Riesenkirsche has published provenance to 1860. This finding also agrees with that from the alignment of ECPGR collections, where a larger group of accessions was also found to be indistinguishable, including multiple accessions under the name Hedelfinger in Germany and Switzerland. None of the other cultivar names have provenance in

the NFC database (noting that Windsor is considered to be represented by 1978-292 Windsor A below) – 1974-210, 1982-045 and 2002-111 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2005-019 Bradbourne Black.

1967-169 Bigarreau Moreau and 1974-163 Unknown

1967-169 had previously been deemed to match a published description of Bigarreau Moreau. Bigarreau Moreau has published provenance to before 1909. The latter accession had originally been accessed under the name of a sour cherry and this would appear to be an identification of a mislabelled accession or possible propagation error. The finding also agrees with that from the alignment of ECPGR collections where accessions under the name Moreau and Bigarreau Moreau in France and Switzerland are aligned – 1974-163 should be deaccessed.

2002-160 Kent Bigarreau and 1967-165 Allman Gulrod Bigarra

2002-160 had previously been deemed to match a published description of Kent Bigarreau. 1967-165 had previously been deemed to match a brief published description of Allman Gulrod Bigarra. This finding agrees with that from the alignment of ECPGR collections where, amongst others, an accession under the latter name in Sweden was also found to be indistinguishable. Amber and Amber Heart (see below) are given as published synonyms by Grubb who also suggests that Kent Bigarreau is less likely to be the one used by Knight. However, from the profile, parentage is plausible for 1968-128 Knight's Early Black and 1952-026 Waterloo as well as 2002-129 Black Eagle B (but not 2002-082 Black Eagle A) – 1967-165 should be deaccessed and naming considered further.

In addition, the following accessions were confirmed to match this group prior to repropagation and, since they were not repropagated, will be deaccessed on the release of NFC 3: 1970-158 Amber, 2002-075 Late Amber, 2002-089 Knight's Bigarreau and 2002-095 Weston's Amber.

1975-093 Napoleon (EMLA), 1963-161 Napoleon (V1006), 1963-162 Napoleon (V1007), 1963-163 Napoleon (V1009), 1963-164 Napoleon (V1010), 1963-165 Napoleon (V1014), 1974-211 Karmazinka and 2017-003 Napoleon (ECPGR Reference 3)

1975-093 had previously been deemed to match a published description of Napoleon and the remainder (with the exception of 1974-211) are listed as clones of Napoleon. Karmazinka has no published descriptions according to the NFC database – 1974-211 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2002-157 Weston's Unknown A.

1968-127 Circassian and 2002-066 Great Bigarreau

2002-066 was previously noted to be indistinguishable from Circassian by morphology and the accession had been renamed Circassian by Imperial College Wye – 2002-066 should be deaccessed.

In addition, the following accessions were confirmed to match this group prior to repropagation and, since they were not repropagated, will be deaccessed on the release of NFC 3: 2002-097 Mill's Seedling, 2002-099 Chelsey Tartarian, 2002-107 Roundel B and 1978-280 Black Tartarian E.

Furthermore, the following accession in the 'East Malling' block was also found to match this group: 2009-028 Bigarreau de Mezel. In agreement with this, Great Bigarreau and Bigarreau of Mezel were listed as synonyms of Mezel by Hedrick, who gives the cultivar name provenance to before 1846 (having been "found" in a vineyard in Mezel, France). Hedrick notes that the tree in question had been growing for thirty years at the time.

However, Hedrick also describes the cultivar Black Tartarian as having originally been introduced to England from Circassia in Russia in 1794 and, noting the other accessions which were found to match, this would appear to pre-date (and therefore potentially identify) the tree 'found' in Mezel. Circassian is listed as a synonym of Black Tartarian by Hogg and others. Hedrick also notes that there is a theory that the cultivar originally went to Russia from Spain. This would suggest that Black Tartarian is the most original documented name, and a name change should be considered for 1968-127.

1987-080 Santina and 1987-128 Ferbolus

1987-128 was noted not to agree with the documented parentage for Ferbolus by Imperial College Wye (supporting evidence is not available although the current data for Reverchon and Hedelfingen Riesenkirche in NFC 4 would agree with this suggestion) – 1987-128 should be deaccessed.

2002-091 Smoky Dun and 2002-125 Yellow Spanish B

2002-091 had previously been deemed to match a published description (by Grubb) of Smoky Dun. Grubb noted Smoky Dunn as a local West Midlands variety. By contrast, 2002-125 came to the NFC via East Malling (in 1925) then Merton (in 1946) and apparently was sourced from a nursery in California. Yellow Spanish as a cultivar is recorded as a 'white' cherry whilst these are clearly not – 2002-125 should be deaccessed and naming considered further.

1981-039 Newstar and 1981-020 Starkrimson

1981-039 had previously been deemed to match a published description of Newstar. 1981-020 had previously been deemed to match a published description of Starkrimson. Newstar has provenance to being raised in 1965 and reported parentage of Van x Stella (which is plausible from the NFC 4 samples) whilst Starkrimson has provenance to being released in 1980 and reported parentage of (Garden) Bing x Stella (which is not plausible, based on an aligned profile of Bing in the ECPGR collections) – 1981-020 should be deaccessed.

1978-271 Werder's Early Black and 2002-100 Sutton's Prolific

Werder's Early Black has provenance to being recorded in 1794 and 1978-271 was previously deemed to match descriptions by Hogg, Bunyard, Grubb and Hedrick. Sutton's Prolific was deemed to match a description in Grubb but was then considered to be a local variety (to Kent) "not frequently met with" – 2002-100 should be deaccessed.

2002-081 Black Oliver, 1973-056 Cristobalina and 2002-090 Norbury's Early Black

All accessions had previously been deemed to match published descriptions for the cultivar names. Black Oliver has provenance to being received by East Malling in 1925, Cristobalina is supposedly a sport of Temprana de Sot that arose in the 1960s, Norbury's Early Black has little available provenance and the name is presented in quotation marks in Grubb with notes that the cherry was said to be grown under various incorrect names.

However, in the ECPGR alignment, the group does not align with an accession of Cristobalina held in France whilst an accession of Temporana de Sot in the 'East Malling' block aligns with the French accession and is clearly different from this grouping – 1973-056 and 2002-090 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2002-094 Wellington B.

1978-294 Burlat and 1967-151 Ries Black Kirsche

1978-294 had previously been deemed to be true to type for Burlat. Burlat has provenance to 1900. Ries Black Kirsche has provenance in the NFC database as being described in 1937 but notes from Imperial College Wye suggest the accession was considered a potential propagating error based on flowering time. The pairing also aligns with accessions of Burlat in France, Germany and Morocco within the ECPGR alignment – 1967-151 should be deaccessed.

2002-061 Old Black Heart A and 1971-095 Bailey's Early Black

2002-061 had previously been deemed to match a published description (by Grubb) of Old Black Heart A (although Grubb notes that the name had been used for many varieties). 1971-095 had previously been deemed to match a published description (also by Grubb) of Bailey's Early Black. Bailey's Early Black has little provenance and Grubb noted that it was "thought by the grower to be an established variety; correct name unknown" (the name Bailey's Early Black was presented in quotation marks by Grubb). Old Black Heart has potentially much older provenance and was in the collection in 1922 – 1971-095 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2002-077 Old Black Heart B.

1978-292 Windsor (A) and 2002-114 Mercer

1978-292 had previously been deemed to match a published description of Windsor. 2002-114 had previously been deemed to match a published description of Mercer. Windsor has provenance to introduction in 1881, Canada. Mercer has provenance to being recorded in 1892, USA. There are no other entries in the ECPGR alignment. Windsor is reportedly the parent of Velvet and Venus (the latter with Hedelfingen) and this parentage is plausible within the NFC samples – 2002-114 should be deaccessed and correct naming considered further.

2002-113 Elkhorn and 2002-062 Turkey Heart

2002-113 had previously been deemed to match a published description of Elkhorn. 2002-062 had previously been deemed to broadly match a published description of Turkey Heart although it was noted that the accession ripened later than the archive description (from the NFC). Elkhorn has claimed provenance to being recorded in 1629 and is noted as a late cultivar. Turkey Heart has no provenance listed in the NFC database – 2002-062 should be deaccessed.

1971-100 Longley's Black Eagle and 2002-109 Cooper's Black

1971-100 had previously been deemed to match a published description (by Grubb) of Longley's Black Eagle. Cooper's Black was referred to by Grubb only as a duplicate with Webb's Black (and Wellington A). Neither cultivar name has clear provenance and Longley's Black Eagle is listed by Grubb as a local Kent variety – 2002-109 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 1970-174 Webb's Black.

1968-126 Bedford Prolific A, 1975-103 Roundel, 1975-107 Emperor Francis B and 2002-129 Black Eagle B

Bedford Prolific has documented provenance to 1882 and 1968-126 had previously been deemed to match the published description of the cultivar by Grubb (noting that Grubb considered the fruit to be indistinguishable from Roundel, with the only distinguishing factors being tree habit and ripening time, whilst verification is typically carried out on fruit only). Provenance for Roundel is unclear and Grubb suggests that it "may be an old variety renamed". 1975-103 had previously been noted to agree with descriptions by Bunyard and Grubb but had also been renamed as Bedford Prolific A in the NFC database. Emperor Francis is documented to be a 'white' cherry and so 1975-107 must be false. Black Eagle B was noted by Grubb to appear "identical with Roundel" (distinguished only by tree vigour and habit, that Grubb attributed potentially to rootstock) – 1975-103, 1975-107 and 2002-129 should be deaccessed.

In addition, the following accessions were confirmed to match this group prior to repropagation and, since they were not repropagated, will be deaccessed on the release of NFC 3: 2002-134 Roundel A, 2002-103 Ronald's Heart, 2002-154 Elton Orchard B+C, 2002-156 Elton Orchard F+G, 2002-088 Black Downton.

1952-026 Waterloo and 2002-126 Seabright

1952-026 had previously been deemed to match the description of Waterloo by Grubb, but not Hogg (based on ripening time and depth of cavity). Seabright was deemed to match a (very limited) description in Grubb. Waterloo has provenance to introduction in 1815 whilst Seabright has no provenance documented in the NFC database – 2002-126 should be deaccessed.

In addition, the following accessions were confirmed to match this group prior to repropagation and, since they were not repropagated, will be deaccessed on the release of NFC 3: 1968-134 Strawberry Amber A, 2002-155 Elton Orchard D&E

1973-079 Alma and 1974-214 Pivka

1973-079 was previously deemed to match a published description of the cultivar Alma that also has provenance to being bred in 1953. The cultivar Pivka is without published description according to the NFC database – 1974-214 should be deaccessed.

1923-084 Bigarreau de Schrecken and 2002-152 Unknown, Large Early

1923-084 had been previously deemed to mainly agree with descriptions of Bigarreau de Schrecken (by Bunyard and Grubb). Bigarreau de Schrecken has provenance to being described in 1868 and originating in Germany. 2002-152 has no records in the NFC database of being named and would appear as an unidentified accession (until now). In the ECPGR alignment data the group was also matched to an accession under the name Grafenburger in Germany – 2002-152 should be deaccessed.

In addition, the following accession was confirmed to match this group prior to repropagation and, had also previously been suggested to be a misnamed replicate of Bigarreau de Schrecken (by Grubb). Since it was not repropagated, 1967-176 Unknown (accessed as Grosse Prinzessinkirsche) will be deaccessed on the release of NFC 3.

1973-122 Jaboulay (VF Bonn), 1975-110 Lyons (EMLA 1) and 1963-167 Boneca

1973-122 had been previously deemed to agree with a description of Jaboulay by Grubb. 1975-110 had been re-named as Jaboulay in the NFC database based on previous analysis by Imperial College Wye, although the tree was noted to appear possibly more upright. Hedrick suggested that Lyons and Jaboulay were synonymous from the point of origin. 1963-167 had been previously deemed to match a published description for Boneca. Jaboulay has provenance to being raised in 1822, as does Lyons (according to Hedrick); Boneca is lacking any provenance in the NFC database. Both Lyons and Jaboulay had been retained following previous (SSR) analysis on the basis that a single differing allele was identified (the marker in question was not replicated in this analysis, having been removed from the ECPGR marker set) – 1963-167 should be deaccessed and both 1973-122 and 1975-110 retained for further consideration.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 1967-149 Ramon Oliva.

2002-105 Turkish Black and 2002-122 Cassia

2002-105 was previously deemed to mainly agree with a description of Turkish Black by Grubb. 2002-122 was deemed to match the NFC description in the files but it was noted that Grubb's description for Cassia was poor (on account that the trees had not fruited at EMR at the time of writing). Turkish Black has no published provenance in the NFC database (and Grubb suggested it could be a renamed old cultivar); Cassia also has no provenance in the NFC database, apart from being grown in the UK. The group is not identified elsewhere in the ECPGR aligned dataset – 2002-122 should be deaccessed and correct naming considered further.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2002-110 Mansfield Black.

1978-332 Alfa (H7) and 2000-138 Alfa

1978-332 was previously noted to match published description for Alfa (although ripening slightly earlier). It is currently not clear why the second accession under the same name was brought into the collection – accessions should be retained for consideration before 2000-138 is deaccessed (unless support is found for retention).

2002-069 Rockport Bigarreau, 2002-098 Bowyer Heart and 2002-065 Chapman B

2002-069 was previously noted to agree with descriptions of Rockport Bigarreau by Hogg, Grubb and Hedrick. 2002-098 was deemed to match descriptions of Bowyer Heart by Hogg and Grubb, but it was previously noted that all three looked very similar in the NFC. 2002-065 was noted not to agree with either of two descriptions of cultivars named Chapman by Hedrick, although it did agree with a description (of Chapman B) by Grubb. Chapman B (specifically) has no recorded provenance in the NFC database and Grubb suggested it could turn out to be of a "well-known American variety" (having been obtained from California); Rockport Bigarreau has provenance to being raised in approximately 1842 in the USA and Bowyer Heart has provenance to being recorded in the UK in 1826. Clearly, these names cannot both be correct for a single cultivar – 2002-065 and 2002-098 should be deaccessed and naming should be considered further.

1976-114 Ironsides and 2002-124 Rock Heart

1976-114 was previously deemed to agree with a description of Ironsides by Grubb. 2002-124 was noted to be very similar to Ironsides and no published description for Rock Heart was available. Ironsides has provenance to being received (by East Malling) in 1925. Rock Heart has no provenance recorded in the NFC database – 2002-124 should be deaccessed.

2002-067 Hoskins and 2000-129 Royal Queen

2002-067 was previously deemed to match a description for Hoskins in Grubb, as was 2000-129 for the description of Royal Queen. Royal Queen has no provenance in the NFC database apart from having been received from California. Hoskins has provenance to having originated in the

USA in approx. 1880 and the reported parent (Napoleon) is plausible in the NFC data – 2000-129 should be deaccessed.

2002-078 Rodmersham Seedling and 2002-104 Strawberry Heart

Rodmersham Seedling has provenance to being described in 1949 where Grubb describes it as being of recent origin and 2002-078 was previously deemed to agree with this description. Strawberry Heart has no provenance in the NFC database apart from being grown in the UK and described by Grubb; 2002-104 was previously deemed to agree with the description by Grubb. Both accessions came to the NFC via East Malling, having been accessed in 1923 and 1933 respectively – 2002-104 should be deaccessed and naming considered further.

2002-121 Coroon and 1968-137 Victoria Black A

2002-121 had previously been deemed to match a published description (by Grubb) of Coroon. 1968-137 was previously deemed to match a published description (by Grubb) for Victoria Black A. Neither cultivar has provenance in the NFC database beyond the descriptions by Grubb. Grubb suggests Coroon (under various forms of the name [Corone, Caroon]) might be a name for a population potentially distributed by seed; Victoria Black is described as a local Variety not seen outside of Kent. The former was originally received at East Malling in 1923 whilst multiple accessions of the latter had been obtained at East Malling between 1926 and 1946 – 1968-137 should be deaccessed and naming considered further.

1967-172 Coop's (Crack Resistant) and 1967-173 Coop's (Not Crack Resistant)

Neither cultivar is recognised as having a detailed published description in the NFC database but, presumably these were thought to be clonal variants with an agronomically relevant trait – both accessions should be retained.

1968-144 Adlerkirsche von Bartschi and 1974-148 Lambert Compact

1968-144 had previously been deemed to agree with a translated description and image of Adlerkirsche von Bartschi. 1974-148 had been noted to be similar to Lambert, but not noticeably more compact in the NFC. Lambert has published provenance to arising in the USA (although dates are slightly confused) in either 1848 or 1880. Lambert Compact has provenance as an irradiated clone produced in Canada in 1958. Adlerkirsche von Bartschi has provenance to being described in 1937 in Switzerland. The group aligns with an accession in Germany under the name Adlerkirsche von Bartschi in the ECPGR aligned dataset and not with a German accession under the name Lambert. Furthermore, the documented parentage of Lambert (Napoleon) is incompatible with the available data, as are three documented offspring of Lambert (Larian, Stella and Olympus) – 1974-148 should be deaccessed.

1968-128 Knight's Early Black A, 2002-101 Carnation C, 2002-071 Circassian B, 2002-102 Lester

2002-101, 2002-071 and 2002-102 had all previously been noted to be indistinguishable from 1968-128 Knight's Early Black A by both morphology and SSR data. 1968-128 had previously been deemed to agree with a published description for Knight's Early Black (by Hedrick). Knight's Early Black has published provenance to 1831. Since the latter three were all excluded from repropagation on that basis, they will all be deacessed on the release of NFC 3.

1968-146 Knauf's Riesen and 1971-099 Knauff's Schwarze

The two accessions had been deemed to be indistinguishable by both morphology and SSR data prior to repropagation. 1971-099 had been deemed to agree with published descriptions of Knauff's Schwarze and in the ECPGR alignment the pair also align with an accession under the name Knauff's Schwarze in Germany. Knauff's Schwarze had published provenance to originating in either 1820 or 1840. 1971-099 was excluded from repropagation and will be deaccessed on the release of NFC 3. The naming of 1968-146 had been changed to Knauff's Schwarze in the NFC database, but the catalogue entry remained as supplied as Knauf's Riesen – naming of the remaining accession should be corrected since Knauff's Schwarze appears to be the more correct name.

1997-005 Buttner's Rote Knorpel and 2007-030 Buttner's Rote Knorpelkirsche

The two accessions had been deemed to be indistinguishable by both morphology and SSR data prior to repropagation. 1997-005 had been judged to agree with published descriptions of Buttner's Rote Knorpel. Since 2007-030 was excluded from repropagation it will be deaccessed on the release of NFC 3.

1979-200 Nutberry Black and 2002-140 Bedford Black B

The two accessions had been deemed to be indistinguishable by both morphology and SSR data prior to repropagation. 1979-200 had been deemed to agree with a published description of Nutberry Black by Grubb and 2002-140 had been recommended for deaccession. Since 2002-140 was excluded from repropagation it will be deaccessed on the release of NFC 3.

1968-121 August Heart A, 1974-213 Mednanska, 2002-143 Fortuna, 1970-171 Di Cesina and 1972-137 Noir de Schmidt A

All of these accessions were previously identified morphologically (and confirmed by SSR analysis) to be F12/1 rootstock. The NFC 2 collection had been propagated on F12/1 whilst the NFC 3 collection was grafted onto Colt. These were therefore all presumably lost either within NFC 2 or at the point of repropagating NFC 2 and all were accepted to be lost prior to repropagation of NFC 4.

1986-027 Favorit and 1983-023 Ispolinskaya Vlkova

The two accessions had been deemed to be mixed up (in the NFC) by both morphology and SSR data prior to repropagation. Both had originally been deemed to agree with published descriptions of their cultivar, but it had been noted that the trees of 1983-023 had later died (in 1989). It had also been noted that the dead NFC 2 trees had then been replaced with an accession of Favorit. Nonetheless, the original accession (1983-023) had been recorded as being propagated into NFC 3 (when the collection was repropagated in 1995) and it was presumed that the graftwood must have come from the replacement, rather than the original trees in the same position. Since 1983-023 was already lost, it was excluded from repropagation and it will be deaccessed on the release of NFC 3.

1981-038 Sunburst and 2000-152 Summer Sun

1981-038 had previously been deemed to agree with a published description of Sunburst. There is currently some confusion around historic tree replacement for 2000-152 in NFC 3 and it has been noted that the two trees of 2000-152 appeared slightly different. Tree 13_24 has been deemed to largely match to published descriptions of Summer Sun and tree 13_23 has been deemed potentially false (being slightly earlier, more acid and with less free stone). Sunburst has provenance to being crossed in 1965 in Canada; Summer Sun was sent for trial in 1973 from the John Innes Inst. The NFC data would suggest that the current profile is for Sunburst as the documented parentage (Van x Stella) is plausible whilst the documented parentage (Merton Glory x) of Summer Sun is not. In the ECPGR alignment the NFC Merton Glory accession also aligns with an accession of the same name in Germany (although provenance for that has not been checked). It would be normal to propagate from tree 13_23 in the first instance and it would appear that this may have carried an error into NFC 4. Samples will be investigated further to confirm whether accessions have been mixed (partly or in whole) – accessions should be retained for further investigation.

2006-015 F12/1, 2017-001 F12/1 (ECPGR Reference 1), 2009-009 CR802-1 (EM Block), 2009-010 189-101-2 (EM Block), 2009-021 F12/1 (EM Block) and 2010-030 JI 2538 (EM) (EM Block)

CR802-1 and 189-101-2 were accessed as known tetraploid versions of F12/1 and would not be distinguished using SSR analysis. 2009-021 was mistakenly identified (at EMR) as being missing from the NFC and is standard F12/1 rootstock. 2010-030 is supposed to be an important self-compatible cultivar from John Innes but had presumably reverted to rootstock in the EMR genebank before accession. A second accession (2010-029 JI 2538 [Ahrensburg]) was found to be distinct and unique in the collection – 2009-021 and 2010-030 should be deaccessed and checks made on the potential status of the latter in the East Malling genebank.

1978-334 Beta and 2002-083 Belle de Choisy

Both accessions had originally been deemed generally true to cultivar descriptions (in 2003). However, more recently queries had been raised around whether the graft in each case had since failed and reverted to rootstock (in NFC 3). The NFC 4 trees from both accessions were confirmed to match their counterpart in cherry NFC 3. In addition, the group was also matched

to individual trees of 1944-030 Dutch Morello, 1963-165 Napoleon (V1014) and 1974-229 Mramorovana and in all three cases the trees were found not to match their counterpart in NFC 3. In each of these latter cases the second tree of the accession was found to be different from the group, and to correctly match its counterpart in cherry NFC 3 (indicating that all of the earlier trees and the two accessions above were failed grafts that had reverted to Colt rootstock) – 1978-334 and 2002-083 should be deaccessed and noted that both accessions were lost prior to repropagation.

The following groups were deemed to be indistinguishable, but it was noted that many of the hybrid and sour cherries had very similar profiles. It is not clear whether the fingerprint profiles are sufficiently robust to reliably confirm duplication in these groups and in the absence of further evidence they should be considered further in due course:

1968-130 May Duke, 1967-179 Mei, 1972-140 Unknown Duke and 2002-084 Planchoury

1968-130 was previously deemed to match a published description for May Duke apart from season.1967-179, 1972-140 and 2002-084 all had ongoing queries over their naming (Mei being noted to have no published descriptions and to be the same as May Duke and 2002-084 being found not to fully match the published description for Planchoury). 2002-085 Archduke was noted to differ from the group by a single (additional) allele – 1967-179, 1972-140 and 2002-084 should be deaccessed.

In addition, the following accession in the 'East Malling' block was also found to match this group and should be considered further: 2009-034 Dubelle Meikers.

2002-059 Flemish and 2002-149 Kentish Red C

2002-059 had previously been deemed to match a published description of Flemish. 2002-149 had been compared to a very limited description (by Grubb, on account that the trees had not fruited by the time of publication). It was noted that 2002-149 did not ripen as much later than 2002-147 Kentish Red A as Grubb had reported (although Grubb's reports were from a secondary source). However, Grubb also speculated that Kentish Red C "may be the 'Flemish Red' described by Hogg and Bunyard". Flemish has provenance to the 1500s – 2002-149 should be deaccessed.

1978-282 Early Richmond and 2002-112 Dyehouse

1978-282 was deemed to match a description of Early Richmond by Hedrick and 2002-112 was also deemed to be probably true to Dyehouse (noting that it didn't support the superior 'beauty' described by Hedrick). Early Richmond has provenance to 1822, Dyehouse has provenance to approx. 1850. The descriptions in Hedrick are very similar but with a small number of distinctions – both accessions should be retained for further analysis.

1972-132 Brusseler Brauner and 1949-116 Griotte d'Ostheim

1972-132 was previously deemed to match descriptions of Brusseler Brauner by Hedrick and Nilssen. 1949-116 was felt to not completely agree with descriptions of Griotte d'Ostheim (based on stone size and darkness of skin colour) but to be close enough to consider probably true. Brusseler Brauner has provenance to being recorded 1785. Griotte d'Ostheim has provenance to being found in the early 1700s – both accessions should be retained for further analysis.

1974-434 Schattenmorelle and 1944-030 Dutch Morello

1974-434 had previously been deemed not to fully match a published description of Schattenmorelle (although partly on fruit size and had been judged to probably be true). No provenance for Dutch Morello is recorded in the NFC database and 1944-030 had not been compared against any published descriptions. Some confusion had been noted in the NFC database, which included notes from Imperial College Wye both that the two matched and did not match by SSR (based on data which remained unpublished). Schattenmorelle has provenance to being recorded in 1558. In the ECPGR data alignment, the group broadly aligns to accessions under the name Schattenmorelle in Germany and Switzerland (noting that the challenges in allele calling in the polyploids are likely to impact alignments) – both accessions should be retained for further analysis.

In addition, the following accession was confirmed to match this group prior to repropagation and, since it was not repropagated, will be deaccessed on the release of NFC 3: 2002-146 Kentish Morello.

1974-431 Morello (EMLA) and 1997-006 Cerella

1974-431 had previously been deemed to agree with published descriptions for Morello. It had been noted that this group was also visually indistinguishable from 1944-030 Dutch Morello, 2002-146 Kentish Morello and 1974-434 Schattenmorelle but these are distinguished based on scrutiny of the current data. 1997-006 had been deemed to match a brief description and image of Cerella. Morello has published provenance to 1597 whilst Cerella has provenance to being raised (as a selfed seedling of Schattenmorelle) in 1954. The profile for 1997-006 would broadly allow for Schattenmorelle being the parent (based on NFC data). 1974-431 was accessed from Long Ashton in 1974 – both accessions should be retained for further analysis.

The following groups involve accessions brought into the 'East Malling' (EM) block. Morphological comparisons in this block are incomplete and since, in many cases only a single tree was analysed, the genetic data have not been replicated. They should generally be considered further before decisions on deaccession can be made.

1968-119 Guigne d'Annonay and 2009-024 Great Black Delicious (EM block)

1968-119 was previously deemed to match published descriptions (by Bunyard and Grubb) for Guigne d'Annonay. In the ECPGR aligned dataset the pair was also matched to accessions

under the names Saint Jean and D'Annonay in France. The accession had been brought in as an apparent donor of early ripening (for which both Annonay and Guigne d'Annonay were both noted by Hedrick). Noting that the analysis of 2009-024 (tree 1) had been replicated and confirmed to match – 2009-024 should be deaccessed.

1984-004 Bullion and 2009-001 Birchenhayes (EM Block)

1984-004 had previously been deemed to match a published description of Bullion although the source of this description is currently unclear (cited to Grubb, but no clear entry for the cultivar in 'Cherries'). This should be considered further, noting that the analysis of 2009-001 (tree 1) had been replicated and confirmed to match. The NFC database notes that a number of 'forms' of Bullion are apparently known.

1978-392 Reverchon and 2009-032 Bigarreau Reverchon (EM Block)

1978-392 had previously been deemed to be true to type and Reverchon has provenance to introduction in 1855. 2009-032 had been claimed (at the time of accession from East Malling) to be distinct from Reverchon and potentially of UK origin. Noting that the analysis of 2009-032 (tree 1) had been replicated and confirmed to match – 2009-032 should be considered further in order to establish any differences from 1978-392.

2010-023 Sweet September (EM Block) and 2010-034 20621 (EM Block)

This should be considered further, noting that the analysis of neither had been replicated. 20621 was accessed as a supposedly tetraploid cherry from Sweden although details of the parental cultivar were not available.

2010-025 Valeria N (EM Block) and 2010-035 Valera (EM Block)

This should be considered further, noting that the analysis of neither had been replicated. The accessions were brought in as representatives of a Ukrainian and a Canadian cultivar respectively. The former was apparently not held elsewhere in western Europe and the latter had a 'historically problematic' S genotype (according to information supplied at the time of accession).

1986-016 Crisana and 2010-008 x gondouinii 'Malishka Duke' (EM Block)

This should be considered further, noting that the analysis of 2010-008 had not been replicated and noting the general challenges in allele calling for the sour and hybrid cherries. 1986-016 had been deemed to generally agree with published descriptions for Crisana.

2010-037 Ujfehertoi Furtos (EM Block) and 2010-042 Erdi Botermo B (EM Block)

This should be considered further, noting that the analysis of neither had been replicated and noting the general challenges in allele calling for the sour and hybrid cherries.

1967-167 Belle de Franconville and 2009-039 x gondouinii 'Kansas Sweet' (EM Block)

This should be considered further, noting that the analysis of 2009-039 had not been replicated and noting the general challenges in allele calling for the sour and hybrid cherries. 1967-167 had been deemed to generally agree with the published description (by Grubb) for Belle de Franconville although ripening was noted to be a little early. Belle de Franconville has published provenance to being described in 1891. 2009-039 was brought in because of a supposedly compact habit and referred to as IR-2 Washington (and is possibly a clonal selection).

1975-105 Morello E and 2009-036 Bruine Waalse (EM Block)

This should be considered further, noting that the analysis of 2009-036 had not been replicated and noting the general challenges in allele calling for the sour and hybrid cherries. 1975-105 had been deemed to generally agree with published description for Morello E (by Grubb).

2010-040 Cacanski Rubin (EM Block) and 2010-041 Chase Morello (EM Block)

This should be considered further, noting that the analysis of 2009-036 had not been replicated and noting he general challenges in allele calling for the sour and hybrid cherries.

2010-003 P. canescens F1296 (EM Block) and 2010-004 P. canescens G254 (EM Block)

This should be considered further, noting that the analysis of neither had been replicated and noting the general challenges in allele calling for the species relatives.

2017-005 P. mahaleb SL64 (ECPGR Reference 7) and 2010-013 P. mahaleb 'Korponoy' (EM Block)

This should be considered further, noting that allele calling in the species relatives is challenging but also noting that the analysis of 2010-013 had been partially replicated (tree 1 and multiplex 2) and confirmed to match. It should also be noted that P. mahaleb SL64 was included in the EMR genebank at the time of accession of the latter, although SL64 was not listed amongst the trees for the collection (the ECPGR Reference accessions were brought in later).

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