

FIRST RECORDS OF TROPICAL ALMOND *TERMINALIA CATAPPA* L. (MYRTALES: COMBRETACEA: TERMINALIINAE) DRIFT MESOCARPS FROM IRISH MARITIME SHORES AND A REVIEW OF NW EUROPEAN RECORDS

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Abstract

The first confirmed records of Tropical Almond *Terminalia catappa* L. drift mesocarps stranded on Irish maritime shores are reported. Previously published and unpublished records from UK and Dutch waters are included in a review of all known NW European records. *T. catappa* drift mesocarps are considered to be true peregrine disseminules most likely originating from populations introduced into the tropical and sub-tropical Western Atlantic.

Key words: Tropical Almond, *Terminalia catappa*, drift mesocarps, strandings on Irish and NW European maritime shores.

Introduction

Terminalia is a monophyletic genus often cited as containing *circa* 150-200 species of trees and more rarely shrubs with a pantropical distribution encompassing both seasonally dry and wet biomes in America, Africa, Madagascar, Asia, Australia and the Pacific region. The systematic identification of *Terminalia* species has long been problematic because inter-species differentiation is unclear and there is considerable variation in morphotypes, anatomy and karyotypes. However, the increasing application of genetic techniques over the last two decades has helped to clarify some of the previous taxonomic confusion (Tan *et al.*, 2002; Maurin *et al.*, 2010, 2017, 2023; Nithaniyal and Parani, 2016; Mishra *et al.*, 2017).

A total of 284 species of *Terminalia* are currently accepted worldwide (Anon., 2022), 75 (*circa* 26%) of which occur in tropical and sub-tropical regions of the New World, generally ranging from Mexico and the Caribbean Islands southwards to Argentina. At least 46 (61%) of these Neo-tropical species occur in wet tropical biomes and hydrometric catchments draining into the Caribbean and Western Tropical Atlantic.

Terminalia species display a wide range of different seed dispersal mechanisms, involving either water (hydrochory), animals (zoochory), and/or wind (anemochory) (Maurin *et al.*, 2023).

Several species of *Terminalia* are economically important, particularly as a source of timber, food (nuts), ethno-medicinal and veterinary uses, and in the tanning industry (Little *et al.*, 1974; Little and Skolmen, 1989; Walter and Sam, 1993; Evans, 1999; Yow, 2001; Chakrabarty and Balarkishnan, 2003; Chitmanat *et al.*, 2005; Cock, 2015; Intharuksa *et al.*, 2016; Lusiastuti *et al.*, 2017; Zhang *et al.*, 2019; Das *et al.*, 2020).

***Terminalia catappa* L.**

Terminalia catappa is a large tree reaching up to 25m in height, naturally found near coastal sandy beaches and mangroves throughout its native range within the Indo-West Pacific region (Plate 1). The fruit is an oval flattened drupe measuring up to 75mm in width with rather sharp edges (Plate 2). Although the fruits, which contain a hard sclerenchymatous endocarp, are locally dispersed by birds and mammals, the mesocarp is composed of an outer spongy layer of aeriferous parenchyma tissue which provides natural buoyancy in sea water for up to two years, thus facilitating more widespread oceanic dispersal (Guppy, 1917; Ridley, 1930).

T. catappa has been widely introduced by man outside of its native range into many parts of South and Central America as well as Africa (Anon., 2022). The fruits, mesocarps, and eroded endocarps are commonly found stranded on beaches throughout the Gulf of Mexico and Caribbean, occasionally as far north as Cape Hatteras in North Carolina, U.S.A. (Perry and Dennis, 2010).

Irish and NW European records of stranded *Terminalia catappa* drift mesocarps

Although there are two undated mesocarps of *Terminalia catappa* in the collections of the National Herbarium in Dublin (Plate 3), donated by Henry Brougham Guppy during May 1915, and listed as having been collected from ‘Salcombe Beach, S Devon’, it would appear that both of these specimens were most likely collected by Guppy in the West Indies rather than the U.K. Guppy (1917) remarked ‘I may add that with the object of directing interest to this matter I sent in May 1915 to the National Museum, Dublin (DBN), a collection of West Indian drift seeds most likely to be found on the Irish coasts’. In preparing his account of ‘Tropical Drift Seeds on the Irish Atlantic Coasts’, Colgan (1919) corresponded with Guppy and acknowledged his help and encouragement, noting ‘that the field of enquiry was untrodden, and might well repay exploration’, and that Guppy’s ‘expectation of a rich yield of tropical seeds from our Atlantic shores is justified’. Nelson (2000) made no reference to Guppy’s DBN *Terminalia* specimens, and considered their U.K. origin as doubtful (Nelson, pers. comm.). Although Guppy (1917) was residing at ‘Rosario’, Salcombe during 1915, and personally collected various species of drift seeds from Devon between 1909 and 1916, he did not specifically mention having collected any *Terminalia*, which at that time would have represented the first known records of

this drift seed from NW European waters. Nelson (2000) remarked that Guppy ‘noted many seeds washed ashore in Britain and Ireland but did not seem to have made a concerted attempt to keep documented specimens from British beaches’.

Since 1978, a total of 25 stranded *T. catappa* drift mesocarps have been confirmed from NW European maritime shores, including 9 U.K., 9 Irish, and 7 Dutch (Table 1). The database includes details on 17 unpublished records, including the first 9 Irish specimens, 5 U.K. and 3 Dutch. Apart from one specimen reported from the Orkneys (Scotland) (Plate 4a), all of the U.K. specimens were recorded from Cornwall (Plate 4b). All of the Irish specimens were recorded from the west coast, including County Clare (7) (Plate 4c, 4d, 4e & Plate 5), County Kerry (1) (Plate 6a) and County Sligo (1) (Plate 6b). Although isolated specimens were recorded along the Dutch coast, almost 43% were collected off the NW coast on the island of Texel (Plates 7 and 8). Almost 55% of the NW European specimens were recorded during January and February (Fig. 1)

On two occasions *T. catappa* specimens were found simultaneously along with two other sub-tropical Western Atlantic disseminules in Irish waters: Sea Heart *Entada gigas* (L.) Fawc. & Rendle and Sea Purse *Macropsychanthus comosus* (G. Mey.) L.P. Queiroz & Snak (Record Numbers 19-23). On another occasion, a stranded specimen of *T. catappa* was found along with a Peach *Prunus persica* (L.) endocarp which may have been of local origin (Record Number 18). An unidentified stalked barnacle (*Lepas* sp.) was attached to a stranded specimen of *T. capatta* from Irish waters (Record Number 17).

The average total length, width, depth and dry weight of the NW European mesocarps were 41.7 (range 31.0-55.5; N=24), 29.3 (range 19.0-43.0; N=24), 19.9 (range 15.0-29.5; N=23), and 4.6 (range 1.6-10.0; N=9) respectively. The average total length/width ratio was 1.5 (range 1.1-2.2; N=24).

Discussion

Considering their abundance in tropical and sub-tropical regions of the Western Atlantic, along with their known flotation capacity in sea water of 24 months, it is likely that the *T. catappa* mesocarps stranded on NW European shores originated from this area and floated *via* the Antilles Current, Gulf Stream and North Atlantic Drift to NW Europe within the estimated minimum passive trans-Atlantic flotation time interval of 14 to 18 months (Quigley *et al.*, 2016; Minchin and Quigley, 2023), supporting Nelson’s (2000) opinion that the NW European mesocarps of *T. catappa* are true peregrine drifters. The occasional co-occurrence of other tropical and sub-tropical Western Atlantic disseminules such as *Entada gigas* and *Macropsychanthus comosus* along with *T. catappa* in Irish waters (Records 19-23) lends further support to this conclusion.

Acknowledgements

We are grateful to the following for sharing their records and advice: Liam McNamara (Fanore, Co. Clare), Rosemary Hill (Waterville, Co. Kerry), John Mark Dick (Co. Sligo), Jane Darke (Cornwall), Martin Gray (Orkney, Scotland), Wim Kruiswijk and Michel Ruehland (The Netherlands), Oliver Maurin (Royal Botanic Gardens, Kew, U.K.), Charles Nelson (Sutton St. Edmund, South Lincolnshire, U.K.), Matthew Jebb, Christina Campbell and Colin Kelleher (National Herbarium, Dublin), and Dan Minchin (Killaloe, Co. Clare). A special note of thanks to Joseph and Patricia O’Keane for their generous hospitality in Bucerias (Mexico).

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PLATE 1. *Terminalia catappa* tree, Bucerias, Nayarit, Bay of Banderas, Pacific Mexico, 25 January 2024. Photograph: Declan Quigley.



PLATE 2. *Terminalia catappa* foliage, fruits, mesocarps and endocarps, Bucerias, Mexico, 25 January 2024. Photograph: Declan Quigley.

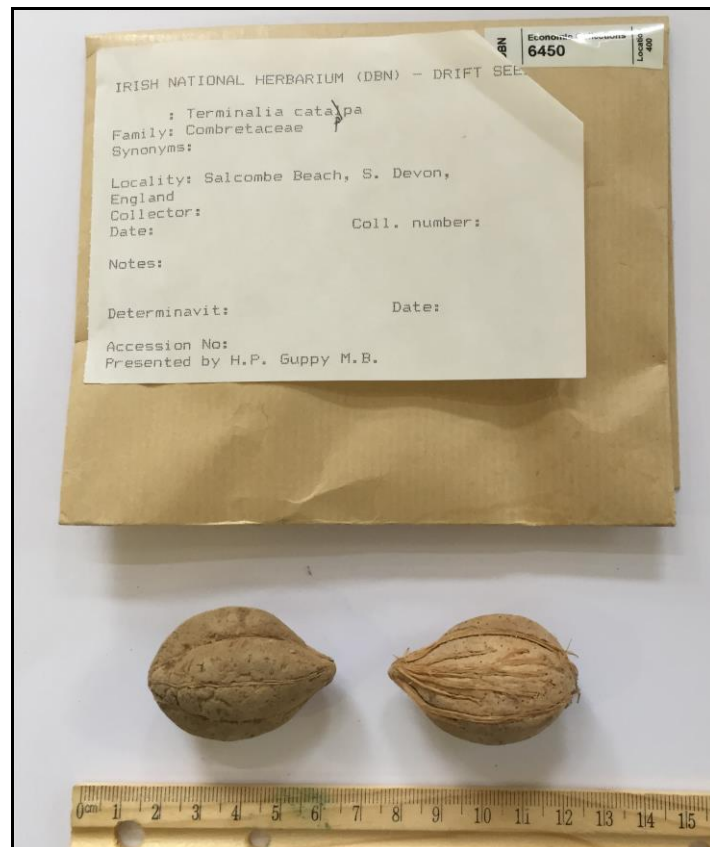


PLATE 3. *Terminalia catappa* mesocarps donated by H. B. Guppy to the National Herbarium, Dublin, May 1915 (DBN 6450). Photograph: Declan Quigley.

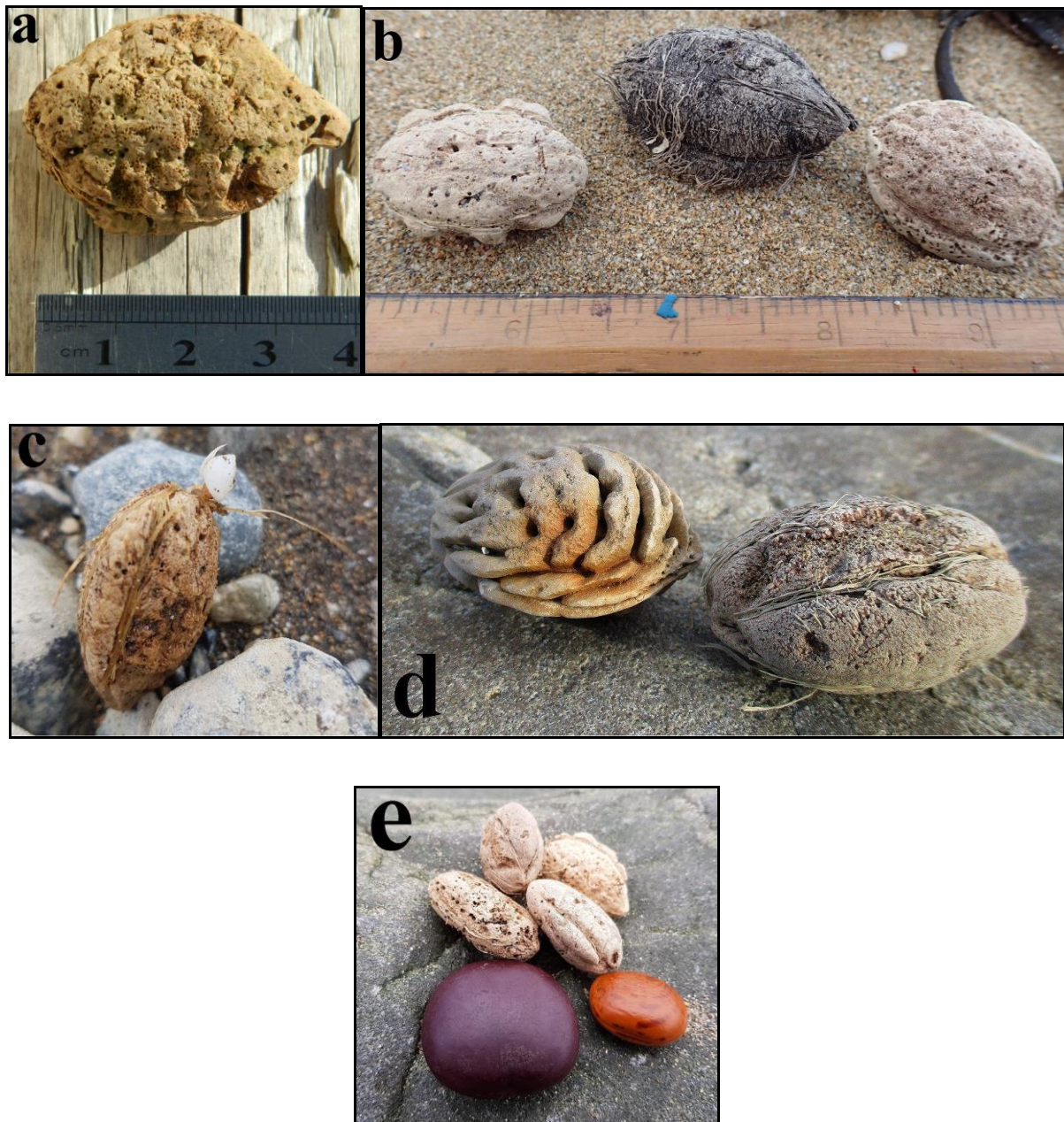


PLATE 4. **a** - *Terminalia catappa* mesocarp from the Billia Croo, Orkney Islands. 13 September 2019. Photograph: Martin Gray; **b** - *Terminalia catappa* mesocarps from north Cornwall, U.K. Photograph: Paul Gainey; **c** - *Terminalia catappa* mesocarp with attached *Lepas* sp., Fanore Beach, Fanore Mor, County Clare, 7 September 2017. Photograph: Liam McNamara; **d** - *Terminalia catappa* mesocarp along with *Prunus persica* endocarp, Seafield, Quilty, County Clare, 13 January 2018. Photograph: Liam McNamara; **e** - *Terminalia catappa* mesocarp along with *Entada gigas* and *Macropsychanthus comosus*, Goilin, Carrowtedaun, Lahinch, County Clare, 5 January 2019. Photograph: Liam McNamara.



PLATE 5. *Terminalia catappa* mesocarp along with *Entada gigas* and *Macropsychanthus comosus*, Tawee Beach, Craggagh, Fanore, County Clare, 26 February 2019. Photograph: Liam McNamara.

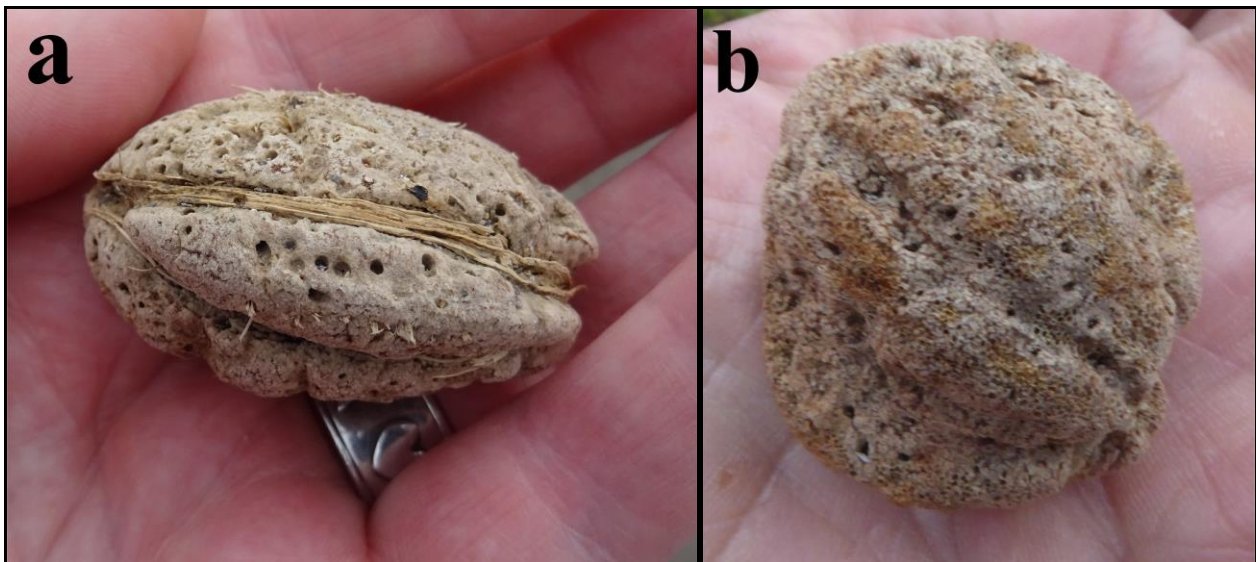


PLATE 6. a - *Terminalia catappa* mesocarp from St Finian's Bay, County Kerry, 15 June 2021. Photograph: Rosemary Hill; **b** - *Terminalia catappa* mesocarp from Dunmorán Strand, County Sligo, 1 October 2022. Photograph: John Mark Dick.

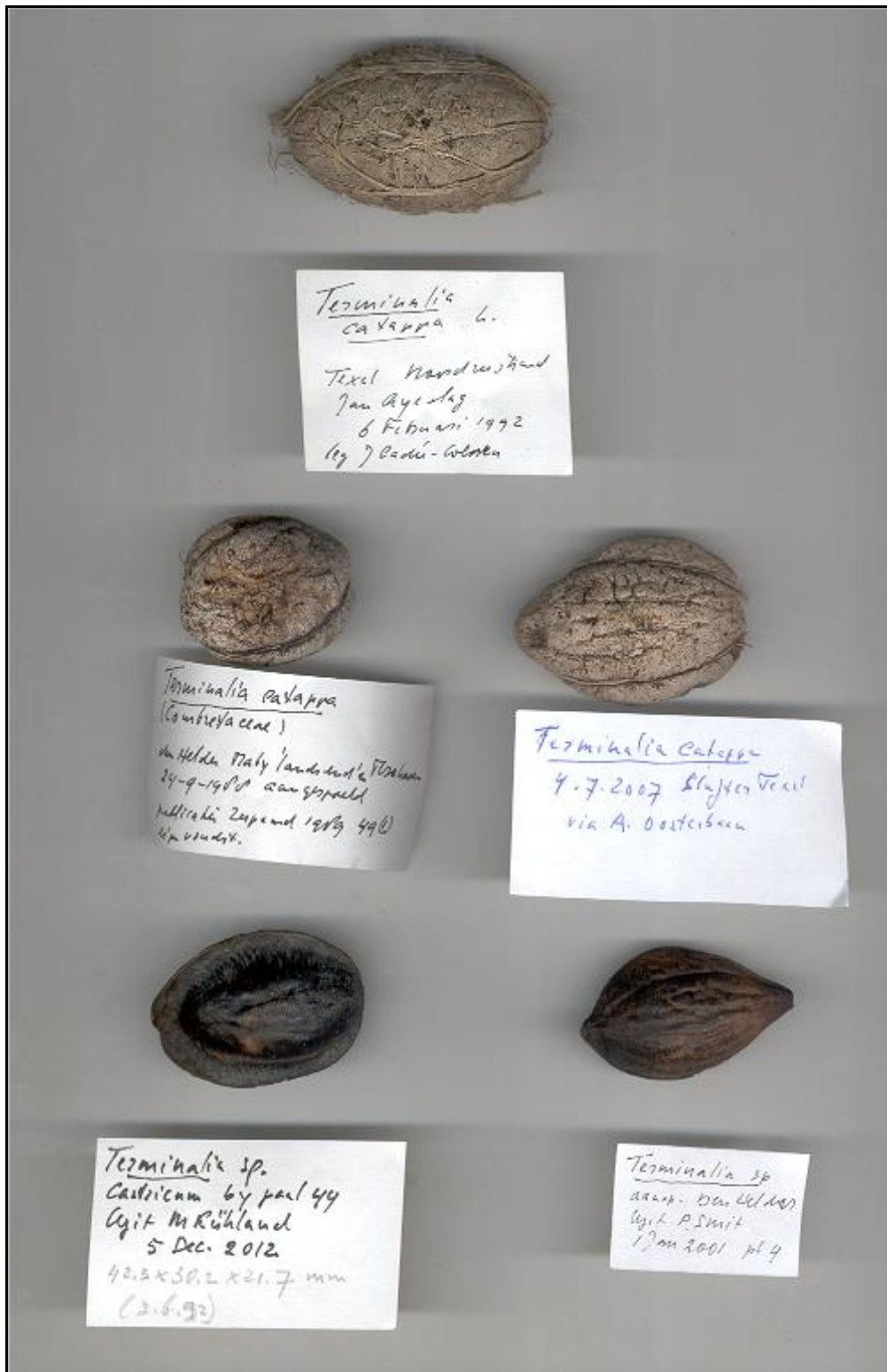


PLATE 7. *Terminalia catappa* mesocarps and endocarps from the Dutch coast. Photograph: Gerhard Cadée.



PLATE 8. *Terminalia catappa* mesocarp, Zandvoort, The Netherlands, 1 November 2017. Photograph: Wim Kruiswijk.

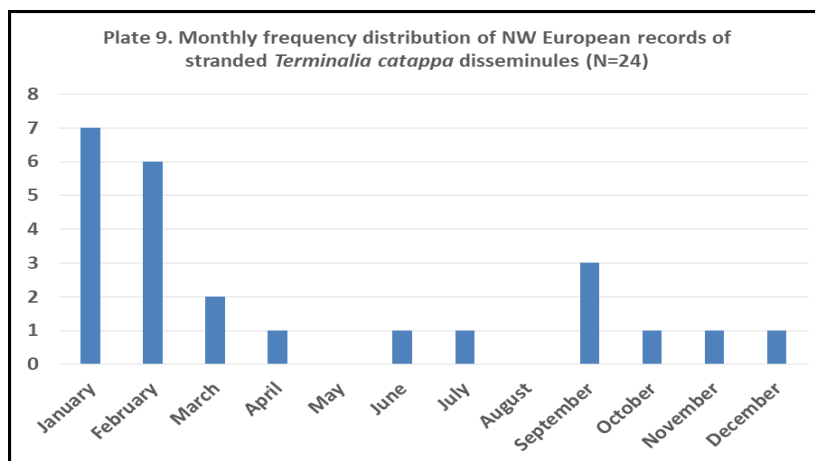


FIGURE 1. Monthly frequency distribution of NW European records of stranded *Terminalia catappa* drift mesocarps and endocarps (N = 24).

TABLE 1. NW European records of *Terminalia catappa* drift mesocarps.

Record Number	Figure Number	Date	Location	Latitude (N)	Longitude	Total Length (mm)	Maximum Width (mm)	Maximum Depth (mm)
1		c.1978	near St. Mary's, Isles of Scilly (SV91), SW Cornwall, UK	49.925	-6.2987			
2		24.09.1988	Den Helder, Netherlands	52.9563	4.7608	34.9	29.1	17.1
3	Fig. 10	06.02.1992	Texel, Netherlands	53.0548	4.7977	50.8	31.8	24.7
4		01.01.2001	Den Helder, Netherlands	52.9563	4.7608	40	25	20
5		12.04.2006	Hors Texel, Netherlands	52.9922	4.7324	51.3	30.3	18.3
6	Fig. 10	04.07.2007	Texel, Netherlands	53.0548	4.7977	45.5	31.9	20
7		13.01.2009	Treyarnon Bay (SW8673), near St. Merryn, N Cornwall, UK	50.5264	-5.025	43	29	21
8	Fig. 3	17.02.2010	Hayle Towans Beach (SW552384), N Cornwall, UK	50.2088	-5.4125	36	26	19
9		03.02.2012	Perranporth (SW7554), N Cornwall, UK	50.3444	-5.1544	35	25	19
10	Fig. 10	05.12.2012	Castricum, Netherlands	52.5453	4.6727	42.3	30.2	21.7
11		24.03.2013	Treyarnon Bay (SW8673), near St. Merryn, N Cornwall, UK	50.5264	-5.025	35	27	21
12	Fig. 3	11.02.2014	Perranporth (SW7554), N Cornwall, UK	50.3444	-5.1544	48	43	18
13		28.03.2014	Gwithian/Upton, Towans Beach, N Cornwall, UK	50.2299	-5.3915	39	30	20
14		Feb-16	Porthcothan (SW8672), N Cornwall, UK	50.5094	-5.0212	42	19	16
15	Fig. 2	13.09.2017	Billia Croo, SW Orkney Mainland Island, N Scotland	59.9723	-3.3512	40	27.5	18.3
16	Figs. 11	01.11.2017	Zandvoort, Holland	52.3711	4.5334	55.5	40.5	29.5
17	Fig. 4	07.09.2017	Fanore Beach, Fanore Mor, Co Clare, W Ireland	53.1199	-9.2881	45.5	34	21
18	Fig. 5	13.01.2018	Seafield, Quilty, Co Clare, W Ireland	52.8041	-9.4881	37	27.5	21
19						45	31.5	17
20	Fig. 6	05.01. 2019	Golfin, Carrowntedaun, Lahinch, Co Clare, W Ireland	52.9051	-9.3689	40	26.5	19
21						35.5	28	20
22						31	21.5	18
23	Fig. 7	26.02.2019	Trawee Beach, Craggagh, Fanore, Co Clare, W Ireland	53.0929	-9.31	42	19	15
24	Fig. 8	15.06.2021	St. Finian's Bay, The Glen, Ballinskelligs, Co Kerry, SW Ireland	51.5	-10.2	48	37	
25	Figs. 9	01.10.2022	Dunmorran Strand (G542353), Co Sligo, NW Ireland	54.2628	-8.724	38	34	22

TABLE 1 (Continued).

Record Number	Length/Width Ratio	Dry Weight (g)	Collector	Reference	Notes
1			H. Wakefield	Nelson (1990, 2000); Gainey (2014)	mesocarp
2	1.2	2.9	Gerhard Cadée	Cadée (1989)	mesocarp
3	1.6	7.1	Hans Cadée	Cadée (1992a,b,1995,1996,1997)	mesocarp
4	1.6	1.6	Pieter Smit	Brochard & Cadée (2005)	endocarp
5	1.7	3.3	Wim Kruiswijk	This paper	mesocarp
6	1.4	3.1	Arthur Oosterbaan	Cadée (2007)	mesocarp
7	1.5		Jane Darke	Gainey (2014, 2020)	mesocarp
8	1.4		Paul Gainey	This paper	mesocarp
9	1.4		Chris Eaton	Gainey (2014, 2020)	mesocarp
10	1.4	3.6	Michel Ruehland	This paper	endocarp
11	1.3		Jane Darke	Gainey (2014, 2020)	mesocarp
12	1.1		Paul Gainey	Gainey (2014, 2020)	mesocarp
13	1.3		Paul Gainey	This paper	mesocarp
14	2.2		Jane Darke	Gainey (2014, 2020)	mesocarp
15	1.5	5.1	Martin Gray	This paper	mesocarp
16	1.4	10	Wim Kruiswijk	This paper	mesocarp
17	1.3		Liam McNamara	This paper	mesocarp along with attached <i>Lepas</i> sp.
18	1.3		Liam McNamara	This paper	mesocarp along with <i>Prunus persica</i> endocarp
19	1.4				
20	1.5		Liam McNamara	This paper	mesocarp along with 1 <i>E. gigas</i> & 1 <i>M. comosus</i>
21	1.3				
22	1.4				
23	2.2		Liam McNamara	This paper	mesocarp along with 6 <i>E. gigas</i> & 2 <i>M. comosus</i>
24	1.3		Rosemary Hill	This paper	mesocarp
25	1.1	5	John Mark Dick	This paper	mesocarp