

Glass Bottles from the *Loch Ard* Shipwreck (1878): A Preliminary Study

IAIN STUART

This paper emphasises the importance of shipwreck cargoes in the study of artefacts where both the date of the wreck and nature of the cargo are well documented. The sample is small, and the results preliminary, but the study also serves as a reminder of the value of standard reference works in artefact description. The author was then in charge of the Historical Archaeology Unit at the Victoria Archaeological Survey.

The archaeology of glass bottles from the nineteenth and twentieth centuries is not particularly well known in Australia.¹ While there is a considerable literature on bottles, the majority of it deals with bottles as artefacts without context and thus from the archaeological viewpoint is virtually useless. Much of this literature contains statements of 'facts' with little or no evidence of their basis, and the reader is forced to take the authors' claims on faith alone. This is an unsatisfactory situation for a class of artefacts that is ubiquitous in Australian post-contact archaeological sites.

The first stage in developing a greater understanding of bottles as a class of material culture is the description of artefacts from well-established contexts. Once this occurs then analyses of artefacts can be devised that relate artefacts to aspects of cultural behaviour. Artefacts from shipwrecks are useful for descriptive purposes as they usually come from sites with good contextual information. This takes the form of documentary evidence about the nature of the ship, its destination, its cargo and the date of the wrecking. Wrecks are not, however, a perfect time capsule, as material culture within them corrodes over time, and may also be added to by items (especially beer bottles) dropped overboard from passing ships.

Apart from the need for well-described bottle collections, two other areas of research are important to pursue. The question of bottle function is crucial as some archaeological analyses of bottles have proceeded on the basis that bottle function is determined by bottle morphology. Hence there are gin bottles, wine bottles, beer bottles which are compared with each other, while there has been little verification of original function. Preliminary identification of beer in 'champagne' style bottles from the William Salthouse shipwreck raises fundamental questions about the relationship between bottle function and bottle morphology, and also about the possibility of bottle reuse.² Bottles from shipwrecks occasionally retain their contents which can be identified by chemical analysis to provide evidence of bottle function. Bottles can also be related to documentary evidence about the ship's cargo and thus may help to answer questions about bottle function and morphology.

The second question to pursue is the use of the technological changes in bottle production during the nineteenth century as a guide to dating archaeological deposits. During the nineteenth century there was a general trend of increasing mechanisation in the glass industry well documented overseas.³ How do the bottles coming to Australia fit into this trend? Well-described and closely-dated collections must increasingly provide

tighter dating controls – *a terminus ante quem* – for the introduction of each new technological process. It was with these changes in mind that Coutts developed 'A flow chart for dating bottles from Australian Archaeological Sites' based on technological changes reflected in bottle morphology.⁴ This chart appears potentially useful for dating glass from archaeological contexts, but seems not to have been applied to a bottle collection from a site other than Captain Mills' Cottage. The secure dating of shipwrecks provides an ideal control on questions of the arrival of technological change in bottle production to Australia (or strictly speaking almost arrival). Thus bottles from shipwrecks appear promising both in answering questions about technological change and in testing Coutts' flow chart. This paper discusses these issues in the context of the recovery and analysis of glass bottles from the *Loch Ard* shipwreck.

THE *LOCH ARD* AND ITS CARGO

The *Loch Ard* was an iron-hulled, three-masted barque built in Scotland by Charles Connell and Co. Ltd. of Scotstown, in 1873. She was owned by the General Shipping Co., and managed by Aitken, Lilburn and Co. The *Loch Ard* had made several voyages from the United Kingdom to Melbourne and Calcutta. On her fifth voyage from London to Melbourne she was in fog for several days, close to the Victorian coast near Port Campbell. The fog lifted but *Loch Ard* was too close to shore to manoeuvre out. On 1 June 1878, she struck Mutton Bird Island and sank.

There were only two survivors – Tom Pearce and Eva Charmichel were washed up alive in what is now Loch Ard Gorge. The disaster was highly romanticised (there was even an opera) and today the location and the story are an important tourist promotion on the West Coast, Victoria's 'shipwreck coast'. Although part of the cargo was washed ashore and salvaged, the majority of the items seem to have remained on board, protected no doubt by the ship's iron hull. The wreck was sold for salvage to a Geelong partnership but salvage attempts were unsuccessful. Indeed the steamship *Napier*, chartered for the operation, was itself wrecked in Port Campbell harbour in September 1878.⁵ The wreck lay undisturbed until 1967 when it was discovered by Mr Stan McPhee, a local diver. Following the discovery, the wreck was extensively looted by divers. Some used explosives to pry loose items for salvage. The wreck is now a declared Historic Shipwreck under the Commonwealth *Historic Shipwrecks Act 1976*.

The *Loch Ard* shipwreck was chosen for this study for the following reasons. The site was well documented; a collection of bottles existed and was available for study; further bottles were to be raised; and the date of the site, 1878, allowed for comparisons with McCarthy's Commonwealth Centre excavations in Melbourne's Little Lonsdale Street, and with Morgan's work on the *Willian Salthouse* collection.⁶

The *Loch Ard* was carrying 51 passengers and crew and 53,700 pounds worth of cargo. Her cargo manifest has been published.⁷ Details of the glass carried are reproduced as Table 1. It is difficult to determine from the manifest how much of the cargo is associated with glass bottles. There is a section listed as 'glass' which included imports of glass, including empty bottles, as well as a section listing alcohol and other liquids likely to be carried in glass bottles. Other items in the manifest may also have been carried in glass bottles, for example perfumes and medicines. The crew and passengers doubtless also had some products in glass containers but these are unlikely to have been included in the manifest.

Table 1: Details of glass carried by the *Loch Ard* (after Charlewood)

Plate Glass (4 cases)
Foreign Window glass (610 cases)
China and Earthenware £355
Marble £400
Flint Glass £479
Window Glass £24
Glass Bottles £61
Brandy bulk 8827 gal
Brandy case 1920 gal
British spirits in bulk 3391 gal
British spirits case 3391 gal
White wine 868 gal
Beer in glass 141 gal
Foreign and Salad oil 755 gal
Rum 125 gal
Cordials 82 gal
Geneva 13,600 gal
Perfumed spirit 1 gal
Red wine 3400 gal
Assorted oils in stone £1958

The question to be raised at this point is what, if anything, can be established from the manifest that should condition the nature of the archaeological collection? If bottles are functionally related to contents then a suitable sample of the bottles should show a range of bottle types reflecting the breakdown of glass in the manifest, i.e. empty glass bottles, brandy, British spirits (whisky?), white wine, beer, foreign and salad oil, rum, cordials, Geneva (gin), perfumed spirit and red wine bottles. The number of bottle types represented in the collection should also reflect the relative proportion of the beverages in the cargo which were carried in glass rather than in bulk containers. How much of the cargo was carried in glass is difficult to work out. Assuming that those items marked 'bulk' in the manifest refer to products which were in some sort of barrel or cask, rather than bottled, then the relative percentage proportions of the cargo in glass are:

Gin	65.0
Red Wine	16.0
Brandy	9.0
White Wine	4.1
Foreign and salad oil	4.0
Rum	0.6
Beer in Glass	0.6
British Spirits	0.4
Cordials	0.4
Perfumed spirit	0.004

A suitable sample of bottles should reflect these proportions if bottle morphology closely reflects bottle function. The question of what a suitable sample is depends on what the cargo represents in terms of numbers of bottles. A rough assessment has been made based on the overall quantities of alcohol in the manifest. If a ratio of six bottles to a gallon of liquid is assumed then something like 126,042 bottles were on the *Loch Ard*.⁸ Whether this is a correct estimate depends upon the validity of the assumptions on how much of the cargo was in bottles rather than bulk containers. In contrast a minimum estimate based on the quantity of 'beer in glass', the only category of alcohol to mention glass specifically, suggests only 846 bottles were on the *Loch Ard*. The actual number of bottles available for analysis is presently 34. This clearly represents only a small sample from a large cargo, in common with most collections from unexcavated shipwrecks. Whether a large sample of mass produced, and consequently almost identical, items such as bottles is needed to answer the questions discussed in the introduction is debatable. However, since there is a need to understand both morphological variability within bottle types and the possible range of products each type contained, the sample size should be larger.

Consideration of the *Loch Ard* wreck site is now required. Although some cargo was salvaged, including the famous china Peacock, this appears to have come from the deckhouse or the upper decks of the ship. The heavier liquids would have been stored in the lower parts of the ship to retain its centre of gravity. Thus apart from the buckling of the ship's plates when it hit Mutton Bird island the iron hull is likely to have protected the cargo. The condition of the site when it was re-identified in 1967 is not known, although various reports in the *Loch Ard* file held at the Victoria Archaeological Survey suggest that the hull was relatively intact at that stage. The subsequent intensive period of diver looting seems to have seriously damaged the site. How this affected the bottles on the *Loch Ard* needs to be carefully assessed.

All the bottles available for study were collected by visiting divers. Consequently, the collection consists of 'collectable bottles' rather than a representative sample, simply because whole bottles are more attractive to the diver. Most bottles in the sample were either confiscated or collected to prevent their unauthorized removal from the wreck. Thus the collection is biased towards the most collectable and the most durable.

ANALYSIS OF GLASS BOTTLES

The first aim of the study was to provide an adequate description of the bottles from the *Loch Ard*. As with most descriptions the problem was to select a relevant set of attributes. The project has been guided by the Parks Canada Glass Glossary.¹⁰ This work is based on experience with the cataloguing and analysis of glass from archaeological sites in Canada and provides a useful system for describing glass bottles. The second aim of the study was to investigate issues to do with the function of bottles. The key attributes here seem to be size and proportion, shape, closures, colour, decoration, including manufacturers' marks and, if available, description or analyses of contents. The third aim is to investigate questions to do with technological change in bottle manufacture. Here key attributes are those identifying changing production processes such as base and pontil marks, mould seams and closures.

The identification and description of non-metrical features on glass bottles follow the definitions in the Glass Glossary. Key measurements were made to establish basic dimensions and proportions of bottle parts. Running

measurements were made to avoid systematic errors, and proportions were calculated by computer. A copy of the recording system is to be found in Appendix Two.

The first collection used was that stored by the Victoria Archaeological Survey in its laboratory, the second was that held in the Flagstaff Hill Maritime Museum, Warrnambool. The third collection comprised the bottles brought up from the site on 15 October 1990. This latter collection was raised with the current analysis in mind, and some attempt was made to collect glass fragments as well as whole bottles in order to get a more representative sample of items. The three collections comprised a total of 34 whole bottles and 34 bottle fragments. These have been examined and sorted on the basis of morphology into eleven types which are described below.

- Type 1 Salad Oil or Half Whirley bottles.
- Type 2 Sauce bottle
- Type 3 Clear 'Ricketts' type moulded bottle
- Type 4 Singer Oil bottle
- Type 5 Wine or Beer bottle
- Type 6 Wine or Beer half-bottle
- Type 7 Champagne half-bottle
- Type 8 Champagne large bottle
- Type 9 Light Green bottle
- Type 10 Case Gin bottle
- Type 11 Clear bottle

The Table 2 overview shows the emphasis in this collection on complete or near complete bottles. Bottle types 7, 9, 10 and 11 are only known from fragments, which suggests that either these types were not well suited for surviving the shipwreck or that more complete examples are not exposed on the surface. Type 10, for example, has been identified as a case gin. Case gin bottles are known to be fragile and possibly less likely to survive in a shipwreck. Yet gin was a major component of the alcohol cargo on board the *Loch Ard*, both overall and of that part carried in glass.

Table 2 Nature of the Bottle Collection from the *Loch Ard*

Type	Complete	Finish, Body & Neck	Base & Base	Contents
1	12			6
2	2	1		
3	1			
4	2			
5	13	4	4	9
6	2		5	1
7			1	
8	2	3	1	1
9				1
10		1	8	1
11			1	

It is tempting, having eleven bottle types and eleven categories of liquid in glass listed in the manifest, to assume that examples of all types have been discovered. However, the small sample of bottles in contrast to the quantities indicated in the cargo manifest warn against such a simple assumption. Worcestershire Sauce (Bottle Type 2), for example, is not listed in the manifest. Either the bottles could be from the personal possessions of crew or passengers, or Worcestershire Sauce is listed under a broad category in the manifest and thus is invisible. All the above point to the need for caution in the interpretation of the bottles collected so far from the *Loch Ard*. However, the description of the bottle types remains a useful contribution.

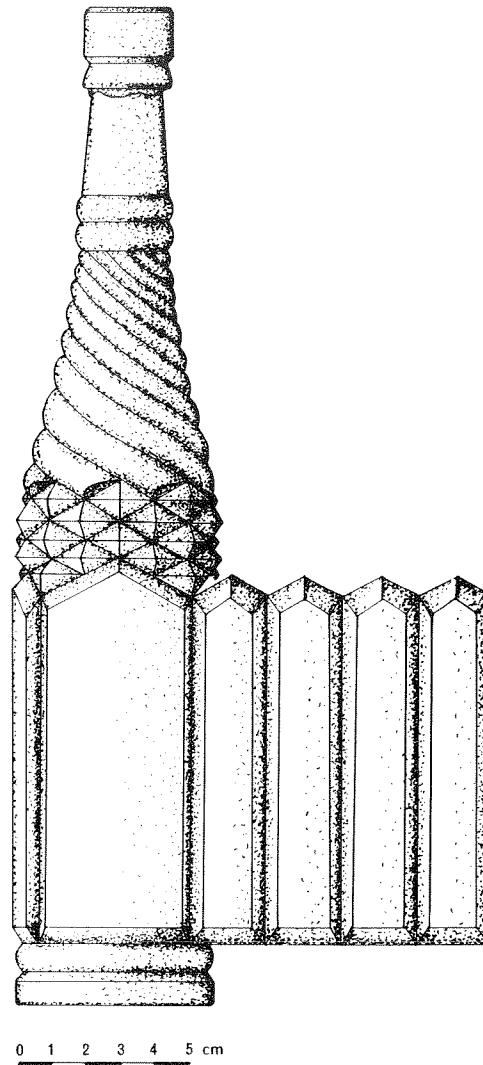


Fig. 1: Type one 'Salad oil' or 'Half Whirley' bottle.

DETAILED DESCRIPTION OF BOTTLE TYPES

Detailed descriptive work has only been completed on Type 1 (Half Whirleys) and Type 2 (Worcestershire Sauce) and the remainder of this paper discusses these types in detail.

Type 1: Salad Oil or Half Whirley Bottles (Fig. 1)

A total of twelve bottles of this type were examined.

Manufacture: This bottle type is made from clear glass with a greenish tinge. It is made in a two-piece mould with a separately moulded base and an applied finish. This bottle form was closed with a glass stopper, several of which have been recovered.

Decoration: The decoration is commonly known as a 'whirley' or 'half whirley'. It consists of five panels asymmetrically distributed around the body; the fifth is larger than the rest. These are surmounted with rows of diamonds and diagonal rings on the shoulder leading to a neck ring. There is minor variation within the type as one bottle has a mamelon on the base rather than a number as the others have.

Metrical Analysis: The mean dimensions of the twelve bottles are as follows (all measurements in mm):¹¹

Heel 8.08	Range 7–8.5
Body 104.4	Range 97–108.5
Shoulder 110.9	Range 110–113
Neck 54.66	Range 51–62
Finish 21.25	Range 16–30
Overall length 299	Range 296–305
Base width 57	Range 56.5–58
Bore 11.5	Range 11–12(4 only)

The proportions of each bottle part were:

Heel	3%
Body	35%
Shoulder	37%
Neck	18%
Finish	7%

Contents: Six of the bottles still have oil-like contents and two others are filled with sand and oil. The exact nature of the oil is yet to be determined.

Type 2: Sauce Bottle (see Fig. 2)

One whole and one broken bottle were examined. A further complete bottle is on display at the Flagstaff Hill Maritime Museum.

Manufacture: This bottle type is made from clear glass with a greenish tinge, in a two-piece mould with a separately moulded base and an applied finish. The bottle was closed with a glass stopper, some of which has been recovered.

Decoration: This bottle type is undecorated but carries the name 'LEA AND PERRINS' (horizontal), 'WORCESTERSHIRE SAUCE' (vertical), and 'A C B Co.' (base).

Metrical Analysis: Only one complete bottle was available for measurement (all measurements in mm):

Heel	2
Body	87
Shoulder	25
Neck	44
Finish	16
Overall Length	179
Base width	53
Bore	12

The proportions of each part are:

Heel	1%
Body	50%
Shoulder	14%
Neck	25%
Finish	9%

Contents: None of these bottles retained their contents.

DISCUSSION

Apart from the obvious differences in size and decoration there is also a contrast between the proportions of Type 1 and Type 2 bottles. Type 1 bottles have a greater proportion of shoulder and neck parts. Both types, however, have long necks. There is also variation within the Type 1 bottles. Examination of the data shows that the greatest variation is in the neck and finish parts of the bottle. The proportion of heel, body and shoulder parts was constant while the proportion of neck and finish parts varied. The main source of the variation is in the application of the finish, which appears to have been carelessly applied: in one case, for example, it seems to be on a slight angle. The other sources of variation are observer error, controlled to some extent by repeating measurements, and minor variation during production. No data appears to be available on the range of variability expected or tolerated in the production of moulded bottles.

With reference to the relationship between bottle function and bottle morphology the 'half whirley'



Fig. 2: Type Two 'Worcestershire Sauce' bottle.

decoration signifies 'salad oil'.¹² The 'half whirley' pattern is found on a number of bottles with similar morphological attributes, such as proportion and decoration. Having a unique morphology helps sell a product by giving it an identity that enables it to be clearly and accurately identified. In semi-literate societies this seems to be particularly important. The classic case of this approach (and possibly not typical) is the design of the standard Coca-Cola bottle. Designed to be identified in the dark or if broken, the advantage of the standard design adopted in 1916 was that it eliminated uncertainty about the contents of the diverse range of bottles in use until then.¹³

Salad oil bottles, characterised by their decorated body and shoulder and elongated neck, acted to identify the contents and helped to sell the product they contained. The Type 2 bottle is a more obvious example of this as it carries the brand name as well as having a distinctive shape. The elaborate decoration of the Type 1 Salad oil bottle is reminiscent of fine table glassware such as decanters. This is likely to have encouraged their placement on dining tables for direct application of salad oil on to food, rather than simply as a container for a product used in food preparation in the kitchen. The decoration gave the bottle and its contents some form of social value although the contexts in which this occurred need to be more thoroughly researched. The question arises how recycling affected the signification. If a bottle was recycled with contents other than salad oil or Worcestershire sauce some attempt might be expected to modify the bottle morphology and warn users of the change – another intriguing aspect of material culture research.

As to bottle-manufacturing technology, the two bottle types discussed were produced by the same technique, i.e. a two-piece moulded heel, body, shoulder and neck with a separate base and an applied lip. Both types have decoration incorporated as part of the mould. Jones *et al* note that this production technique 'becomes the most common container mould type for the late nineteenth and twentieth centuries'.¹⁴ They note that this technique replaces the Ricketts type (three-piece mould) but there was a long time lag in this replacement. Thus the presence of this moulding technique on an 1878 shipwreck is not surprising. Nor is it surprising that Ricketts-type moulded bottles are also found on the *Loch Ard*. Similar bottles are reported from Captain Mills' cottage (see below), from southern New Zealand,¹⁵ and from the USA.¹⁶ In general these bottles tend to be dated from 1880 to 1900 which roughly agrees with the more precise *Loch Ard* date. Indeed Switzer notes that Lea and Perrins Worcestershire Sauce bottles prior to 1880 were embossed 'A C B Co'.¹⁷ The Type 2 bottles fit into this dating.

A 'Flow Chart for Dating Bottles from Australian Archaeological Contexts' was developed by Coutts in the course of his work on Captain Mills cottage.¹⁸ The flow chart was based on American studies aimed to date bottles by technological features. Such charts can be of considerable value to archaeologists especially for field assessments of archaeological sites and for dating poorly stratified or documented sites. *Loch Ard* Types 1 and 2 bottles were dated using the flow chart as a way of evaluating its utility. It was expected that the bottle types would be easily dated since both had been recovered from Captain Mills cottage. The key tests for evaluating the chart were, first, that the bottles were dated correctly and, second, ease of use.

In the event these two criteria were interrelated. The major difficulty was in understanding how to use the flow chart to produce a date. At the end of each phase of the chart a date range is produced. How differences in the date ranges are resolved is not explained. For example, after examining Type 1 the following date ranges were produced:

'Any bottle part'	1860-1900
'Neck finish'	1880-1920
'Base finish'	none
'Embossing'	1860+
'Colour/fabric'	one
'Closure'	1840+

Thus the bottle could date from 1840 onwards, virtually a useless date, or taking the most restrictive date range 1880-1920. There is no guide to assist in evaluating which is the most relevant set of dates or how to combine them. This difficulty may well be reflected in the contradictory dates that Coutts gives for his half whirley bottles (bottle type O2.1). At one point they are dated at 1860-1900¹⁹ and another at 1890-1916.²⁰ It is clear that the flow chart needs some work to resolve this issue, but the bottles do fall into roughly the right date range.

CONCLUSION

At the start of this paper the lack of archaeological knowledge of nineteenth and twentieth-century glass bottles was discussed. This paper began the long process of addressing this issue by describing a collection of bottles from a well-dated site with a secure context. In doing so the nature of the *Loch Ard* cargo and the taphonomy of the shipwreck site have been discussed in order to understand the context of the artefact collection available for analysis. The question of the relationship between bottle function and bottle morphology was

briefly discussed. Bottle morphology in the case of the Type 1 'Salad oil' bottles can be seen as extending the function of the bottle by signifying the contents and thus assisting its sale. Bottle making technology and the use of Coutts' 'Flow Chart for Dating Bottles' were examined. In essence Coutts' flow chart proved difficult to use. However the concept seems useful and the challenge is open for a refined version to be produced.

Finally more about the significance of the *Loch Ard* itself is emerging. The wreck site is historically significant in its own right. The site contents here selected are relevant to the overall study of glass bottles on Australian post-contact sites and to the study of Australian and world trade. For the *Loch Ard*'s cargo of glass bottles was bound for 'Marvellous Melbourne', a colony awash with alcohol. The bottles could have looked forward to an active life in the Victorian systemic context, perhaps in a brothel or at the Melbourne exhibition, had they not, through a most tragic shipwreck, entered the archaeological record.

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NOTES

1. e.g. Baugher-Perlin 1982; Morgan 1990.
[The publication of Dr James Boow's archaeologically-useful Australian Commercial Glass Manufacturing Processes, Research Study No. 10, by the NSW Heritage Council in 1989 should be noted in this context - Editors' note].
2. Barron (pers.comm.) since confirmed by analysis conducted by Carlton United Breweries.
3. Frank S. 1982: 37-38.
4. Coutts 1984: 383-387.
5. Victoria Archaeological Service (VAS) file *Napier*, held by the Maritime Archaeology Unit.
6. The Maritime Archaeology Unit of VAS, as the delegated unit under the Commonwealth *Historic Shipwrecks Act 1976*, has been monitoring the condition of the *Loch Ard* shipwreck. Part of this programme includes monitoring known collections of *Loch Ard* artefacts and the salvaging of portable artefacts from the wreksite in order to prevent their unauthorised removal by divers. (Morgan 1990).
7. Charlewood 1977: 181-183.
8. This was the official measure: things may have varied in practice. Ross 1983: 49.
9. One theory argues that the stern of the *Loch Ard* has never been found. This is based on the non-observation of typical stern fittings such as rudder gear on the wreck site. If this is true then the bulk of the alcohol may be with the stern as alcohol was usually carried in the stern. (K. Hosty pers. comm. 1990).
10. Jones & Sullivan 1985.
11. Range rather than standard deviation is used due to small sample size.
12. Vader & Murray 1979: 74 illustrates five types of salad oil bottles.
13. Anon 1986: 41-46.
14. Jones & Sullivan: 28
15. Although not in detail see Ritchie, N.A. 1986: 162 & 182.
16. See Switzer 1974.

17. Switzer 1974: 79.
18. Coutts 1984: 383-387.
19. Coutts 1984: 239.
20. Coutts 1984: 388.

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