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Genoese Ordnance Aboard Galleys and Merchantmen in the 16th Century

Renato Gianni Ridella

Introduction

It is common knowledge that at the dawn of the modern era, Genoese ships, like those of the other Mediterranean powers, were divided into two categories: sailing freighters and the oared galleys. These both derived their peculiarities, structural and operational, from the Roman *naves onerarie* and *trireme* respectively, via the Byzantines. I repeat this truism only to introduce a subject, in contrast comparatively unknown, concerning the ownership and the management of these two types of vessels in Genoa. Her Republic, born in the 10th century more like a trade company than a true State was, throughout its whole life (ending in 1797), a political body with a rather light touch where the private interests of its merchant and financial oligarchy had a prevalent role (see Grendi 1987).

For these reasons during its epic development in the Middle Ages the Republic never had its own public fleet. The participation in the Crusades, the colonization in the eastern Mediterranean and the Black Sea and the wars against Pisa and Venice, were always carried out with ships placed at its disposal by private citizens remunerated by hire or profit sharing.

Then, when Genoa's eastern colonies fell into Turkish hands in the second half of the 15th century, the Genoese oared ships lost their function of transport and served only as warships. As a consequence, and also because of their high operating costs, the Genoese galleys were reduced in number from more than a hundred to a few dozen.

In contrast, the sailing ships maintained their prevalent civilian function even if, when required, they could be armed for war (*armate in guerra*) and employed as troop and supply carriers or used as floating strongholds.

In 1559, however, the Republic did fit out a little squadron of state galleys (at first four ships) in order to oppose the North African piracy along the Ligurian and Corsican coasts and to escort the silver shipments coming from Spain as reimbursements for the loans of the Genoese financiers to the Spanish Crown (Lo Basso 2003, 206–207).

The modernization of Genoese sea ordnance from the end of the 15th century, and the previous situation

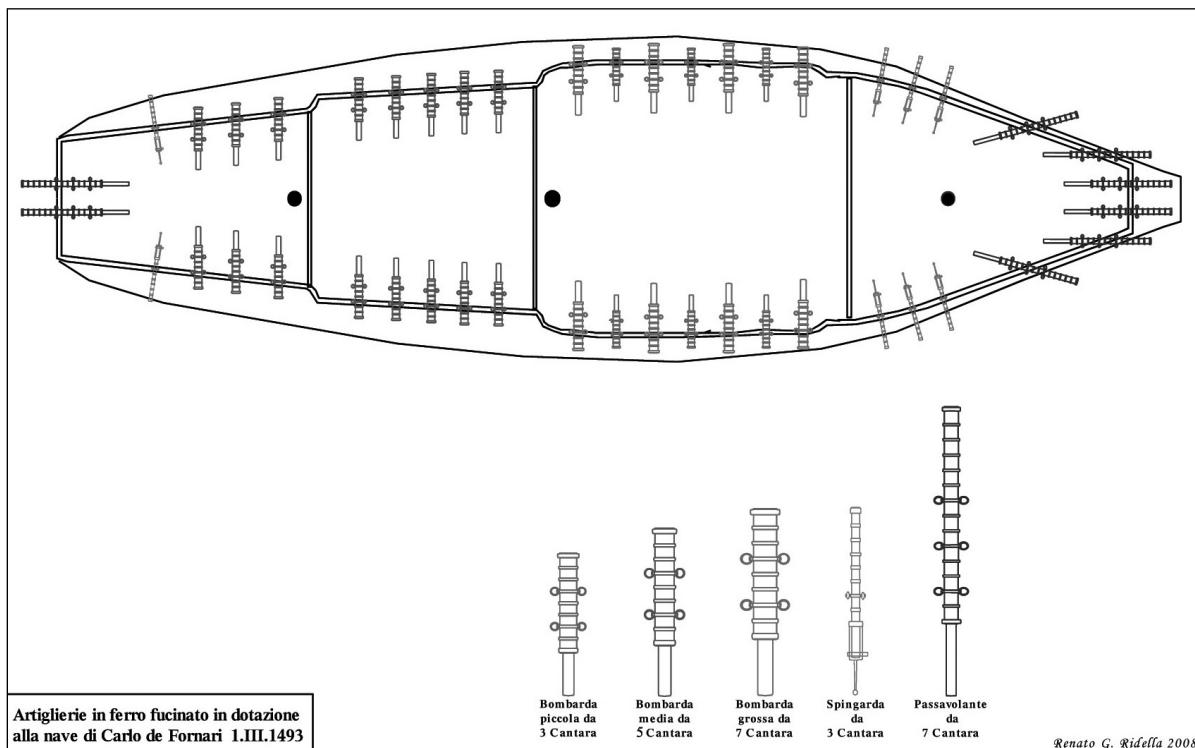
Examining the archival documentation we can affirm that in Genoa modern sea ordnance was born from a decree of July 1498. Actually, on 29th of that month the *Officium Maris* (Office of the Sea), a magistracy of the Republic, had enacted this provision (D'Albertis 1893, 232–233):

“... that every ship which rates more than 10,000 Cantara (480 tons) has to have two bronze cannons: one weighing 27 Cantara (1,286 kg) and the other one 23 (1,096 kg), both firing a 50 Libre shot (roughly 16 kilos). As well as four falcons each weighing 7 Cantara (334 kg). This in addition to the ordinary equipment composed of 35 iron bombards and 15 archibuxi (in this case corresponding to the French arquebuses-à-croc as the individual shoulder weapons were still represented by crossbows), these last made of iron or bronze”.

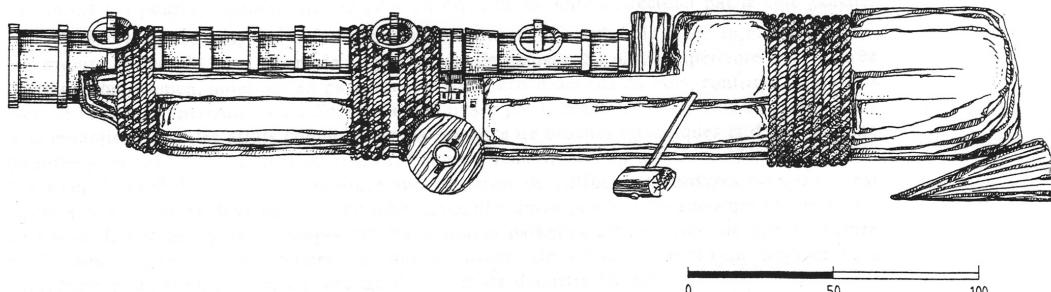
That resolution answered a submission from the *Consiglio degli Anziani* (Council of the Elders), dated 4th July, that said (Gatti 1978, 18):

“... we think it has been known for some time that the foreign nations, especially the French, have introduced heavy bronze ordnance aboard their ships. So, although this ordnance is placed in small vessels, shooting from a long range, it is enough to defeat every big ship. For this reason, nowadays, our sailing is dangerous even if our ships are of a large size, which everyone knows and they are very well equipped with iron bombards”.

From these words we can understand that in this period the Genoese merchantmen, though very large and carrying a lot of bombards, had become an easy prey for smaller piratical or corsair ships that had, in contrast, the new bronze ordnance. With these long-range weapons they were able to hit the Genoese vessels, while keeping themselves out of the range of fire of the latter.



a) Wrought iron ordnance aboard the Genoese ship Fornara according to a notarial deed dated March 1493.



b) Medium weight bombard recovered from the wreck of the Genoese merchantship Lomellina (from Guérout, Reith and Gassend 1989).

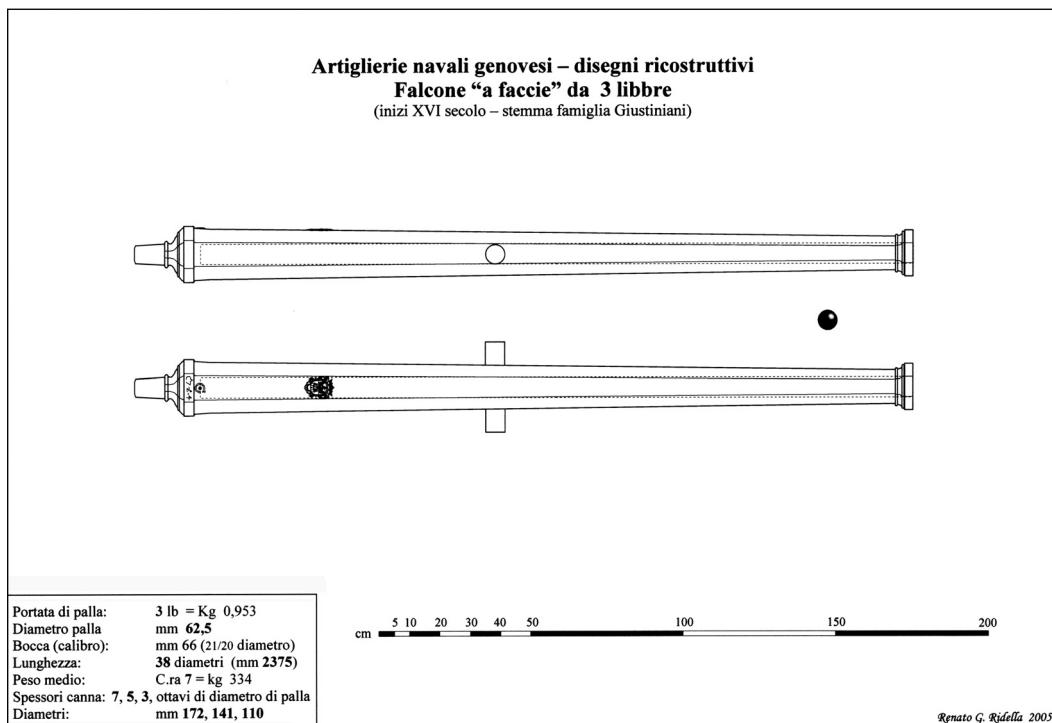


c) The barrel (tromba) of a passavolante (from Gasperoni 1779).



d) Lead coated wrought iron shots for the passavolanti, re-employed in a bronze demi culverin found in the Sciacca wreck (Photo: Soprintendenza di Agrigento).

Figure 6.1. Wrought iron ordnance aboard Genoese merchant ships and galleys in the second half of the 15th century.



a) Reconstructive drawing of a Brizio Giustiniani's falcon cast in 1498.



b) Early 16th century Genoese falconet found off Lido Burrone, Favignana (Egadi Islands, Sicily). The weight mark Cantara 6 – Rotoli 74 corresponds to 321 kg (Photo: Antonino Palazzolo).

Figure 6.2. Early Genoese bronze ordnance: falcons and falconets.

A notarial deed (ASG, NA, f. 1296, 1.II I.1493) informs us that in 1493 the ship *Fornara* (Figure 6.1a) was equipped with 30 wrought iron bombards of various sizes and weights (Figure 6.1b), 8 light *springarde* and 8 heavy *springarde*. I think that the first could represent the early swivel guns as can also be gathered, in another case, from one on them being placed in a crow's nest (*gabbia*) (Gatti 1978, 19). While the latter should correspond to the long barrel *Passavolanti* (Figure 6.1c) that then already fired lead shot – diameter about 100 millimetres (Promis 1841, 175–177) – containing an iron dice or rough spherical iron shot covered with a thin coating of lead (Figure 6.1d). However, their fire could not reach satisfactory distances, possibly owing

to their weak structure, which was not able to withstand strong charges of powder, and also to the loss of pressure between their barrel and the removable chamber. That is confirmed by the adoption, after the 1498 decree, of the bronze falcons (Figure 6.2) which then also employed lead shot (D'Albertis 1893, 234).

From the archives (see also Ciciliot in these volume) we know that various types of Genoese bombards then existed. The light one weighing 3 *Cantara* (140 kg), the medium at 5 *Cantara* (240 kg) and the heavy at 7 and 9.5 *Cantara* (330 and 450 kg). For this last type we also know the length: 8 *Palmi* (c. 2.00 m), and the weight of its stone shot: 25 *Libre* (8 kg, with a diameter of roughly 190 mm).

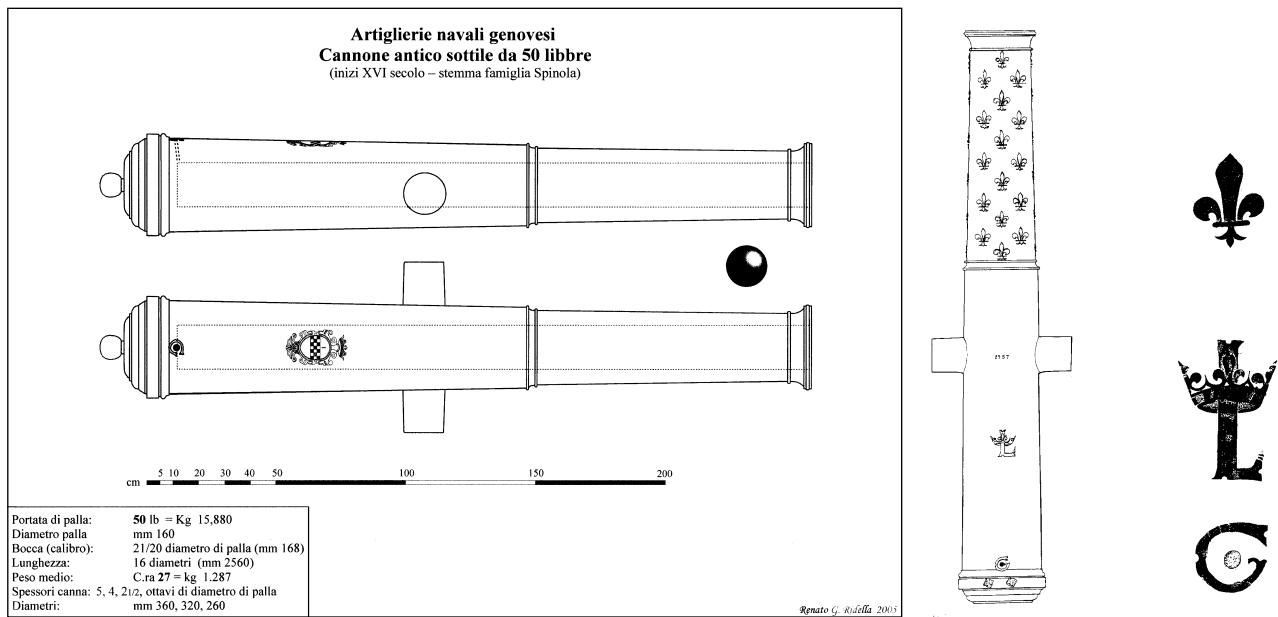


Figure 6.3. Reconstructive drawing of a lightweight Genoese cannon (left) made by comparison with an exemplar (right) cast for Louis XII of France (1498–1515), now preserved in the Musée de l'Armée, Paris (inventory N. 73 – From Guérout & Liou 2001).

The bronze cannons cited, weighing from 23 to 27 *Cantara*, that had to supplement the fire of the bombards, succeeded in this function only because of the higher destructive power of their cast iron shot – 50 *Libre* in comparison with the 15–25 of the stone shot. But their range of fire would not be very much longer than that reached by the bombards because their weight shows that they had thin walls and a short length (possibly 15–16 bore diameters). We do not know their true appearance as none of them have survived (to the present) but I think they may resemble the coeval French light cannons (Figure 6.3) since, in this period, there was evidently a correlation between the French (Provençal) and Genoese gunfounding (Ridella 2006, 167). Maybe they were chambered pieces and could enter into the Italian category of the *Cannoni sottili* (cannons having thin walls). Owing to their unsatisfactory performance, their production would already have stopped in the first years of the 16th century, but we can still find some of them in the 1540 inventories of Genoese merchant ships.

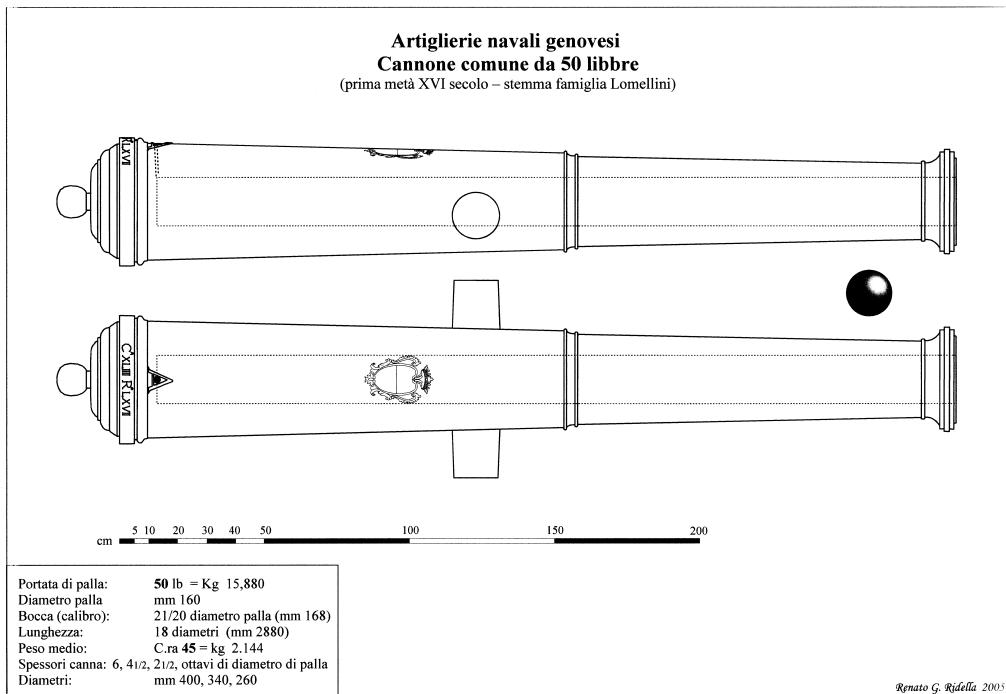
Returning to the 1498 decree, the Genoese ship-owners did not have to go abroad to stock up with bronze pieces in order to provide equipment conforming to the decree of the *Officium Maris*. Indeed, two skilful gunfounders were then working in Genoa, Gregorio I Gioardi and his almost contemporary nephew Andrea Merello. In another archival record of the same year (ASG, NA, f. 1037, 3.IX.1498, 19.XI.1498) we read that the latter cast two cannons and four falcons for the ship *Santa Maria*, owned by the nobleman Bartolomeo Roisecco. A note specifies that the four falcons ‘have to be of the same type as those aboard captain Brizio Giustiniani’s galleys’ cast by Gregorio I Gioardi (Figure 6.2a). From this record we know that a similar evolution regarding the ordnance had already started

in the oared Genoese warships that up to this period were equipped with bombards and *passavolanti*, too. The number and typology of the wrought iron ordnance aboard the Genoese galleys toward the end of the 15th century could be gathered, till now, only from a more recent source dating to 1513 when the Republic gave Andrea Doria the command of two such ships hired from private owners (Figure 6.1a). As the equipment set for these galleys consisted of only six bombards each, Doria asked that they also be strengthened with bronze falcons but that was denied him. At that time the Genoese State was rather poor though populated by a number of very wealthy persons and, in order to increase his fire power, he was eventually obliged to purchase two falcons out of his own pocket from his cousin Nicolò Doria (Pandiani 1935, 10, 15).

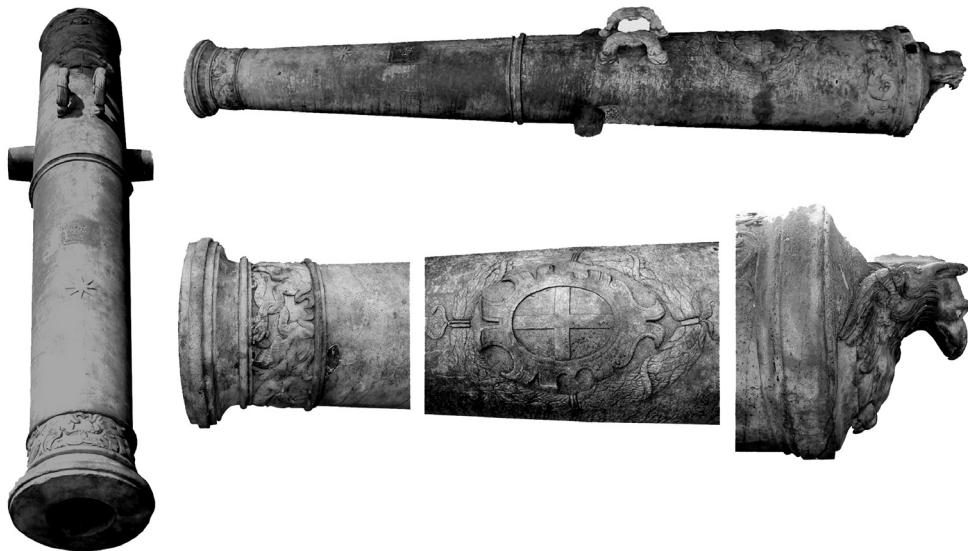
The development in the 16th century – composition of the equipment

Anyhow, aboard the public and private Genoese galleys, the wrought iron pieces should have been entirely replaced with bronze ordnance before 1540 (ASG, Mar, f. 1666) while they continued to be employed on the merchant ships for a large part of the 16th century. Actually, they could still be useful in close range fire, with stone or canister shot, against the piratical North African foists just before the boarding. An example of that are the bombards (Figure 6.1b) found in the wreck of the Genoese merchant ship *La Lomellina*, sunk on Sept 1516 in the bay of Villefranche, Provençal coast (Guérout, Rieth and Gassend 1989, 99–111). Her bronze ordnance, possibly the two cannons and the four falcons set in the 1498 decree, was surely recovered soon after the wreck, together with the field pieces she was carrying.

Coming back to the galleys, we can see that in the



a) Reconstructive drawing of a medium weight cannon employed aboard the Genoese galleys in the 16th century.

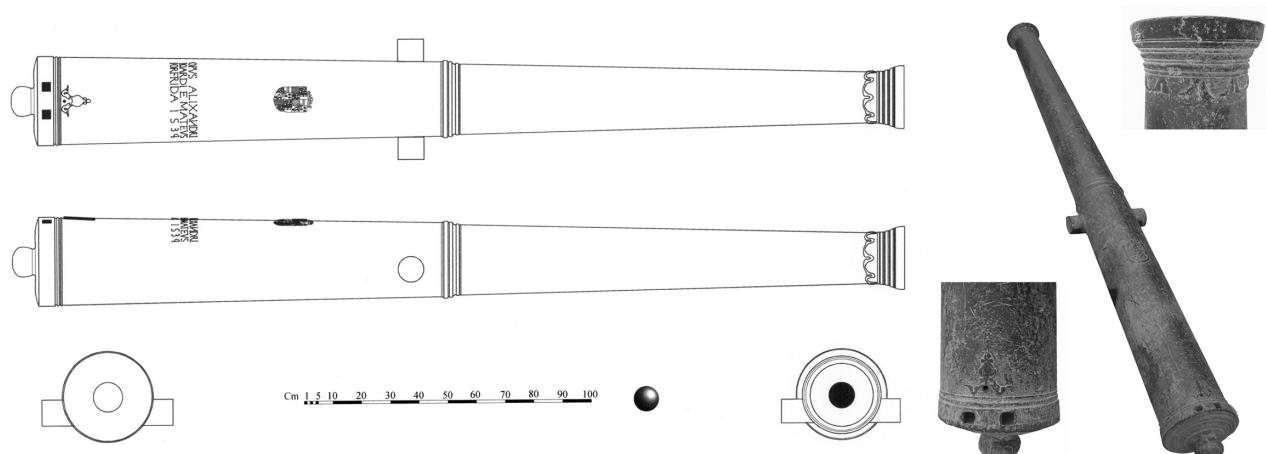


b) Genoese heavy battery cannon cast, possibly by Gregorio II Gioardi, around 1560. Now in the Royal Artillery Museum, Woolwich (Photo: Robert Smith & Ruth Brown).

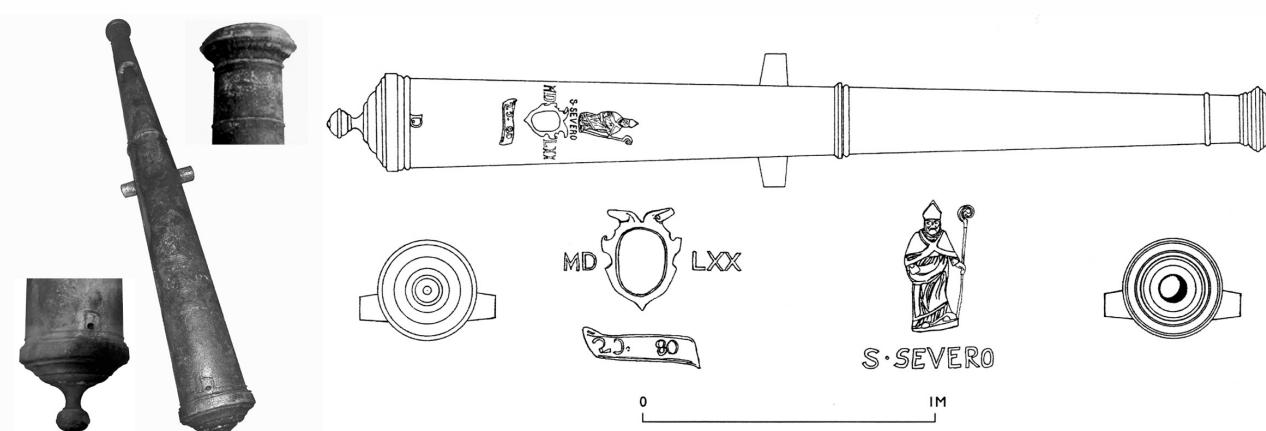
Figure 6.4. Genoese bronze cannons in the 16th century.

early 1540s the bronze ordnance equipping the *Galea Patrona* (vice-flagship) of the Republic was composed of a *Canone de la corsia* (centreline cannon), two *Sagli* (sakers) and two *Smerigli* (breech-loading esmerils) (ASG, Mar, f. 1666). From archives we can understand that the main piece was no longer the light-weight cannon of the 1498 decree but a medium-weight one that we can label as a *Cannone comune* (Figure 6.4 a), the weight of which ranged from 40 to 45 *Cantara* (1,906–2,144 kg). Like the previous one it should be quite similar to the contemporary French cannon, some exemplars of which are displayed in

the Musée de l'Armée, Paris (inventory numbers: N. 72, N. 75, N. 76, N. 78, N. 80). The earliest information about this type dates back to 1507 when Gregorio I Gioardi was obliged to move his foundry to Lerici, a country near La Spezia, as the French garrison from the stronghold of the *Castelletto* bombarded the Genoese harbour zone where he usually worked (Ridella 2006, 172). This happened during the revolt of the commoners which was quickly stifled by the Genoese aristocrats with the help of Louis XII of France. At first these cannon were also intended to be employed as battery pieces but it soon became evident that,



a) Heavy piece cast by Alessandro Gioardi in 1534, now at Famagusta (from Ridella 2004a).



b) Heavy piece cast by Dorino II Gioardi in 1570, in the National Museum of Ireland, Dublin (Drawing from McElvogue 2002).



c) Medium weight piece cast by Gio. Battista Gandolfo (1580s-1590s), found off Brsecine, Croatia (Photo: Renata Andjus).

Figure 6.5. Bronze sakers from Genoese manufacture.

because of their rather thin walls, they could not sustain the continuous fire needed in a siege operation. For this purpose heavier cannons, the *Cannoni rinforzati*, began to be produced (Figure 6.4b). In Genoa the first report about this type dates to 1514 when the same Gregorio I Gioardi cast a cannon weighing 53.15 *Cantara* (2,532 kg) by the re-melting of an old bombard named *La Cagnassa* (The Bad Bitch) (ASG, AS, f. 3098, 29.III.1514). But until 1547 only a few of these heavy cannon were produced and none of them could be drawn up when, in the same year, the Republic had to form a battery to besiege the castle of Montoggio where the survivors from Gio. Luigi Fieschi's failed plot had been entrenched (ASG, CGF, f. 621). The ten cannon deployed there were only of the medium-weight type and some of them, too overheated by the continuous fire, burst, killing or wounding their gunners (Oliva 2001, 40). So, from this time, the employment of the medium-weight cannon was limited to the galleys, where they had to fire only a few shots before the boarding and remained in this function for almost the entire 16th century.

Looking again at the *Galea Patrona* we can observe that the firepower of the Genoese galleys should have been increased, in the first decades of the 16th century, with the adoption of heavier pieces than the falcons – the sakers. From the inventories of the Genoese strongholds and of the merchant ships, during the 1530s–1540s, we learn that these first medium-weight types fired a 6 *Libre* (1.9 kg) shot, had a bore diameter of 83–85 mm, a length of 28–30 diameters and weighed roughly 12 *Cantara* (572 kg). In 1535 Luchino II Gioardi, Gregorio's half-brother, cast two sakers of this weight for the Spanish ship *Santa Maria de Bisogno* (from Majorca – captain: Pedro Gilet (ASG, NA, f. 1739, 22.V.1535)). However, in general, the Spaniards requested from the Genoese gunfounders longer (35 diameters) and heavier sakers than these last, like the one cast by Alessandro Gioardi in Messina, Sicily, in 1534 (now displayed at Famagusta, Cyprus (Figure 6.5a)) or that produced more recently (1570) by his cousin Dorino II Gioardi (Figure 6.5b) for the Catalan ship *La Juliana*, (sunk off Streedagh Strand, Sligo (Ireland), in 1588 when she was serving in the Armada (McElvogue 2002, 35–40; Ridella, 2004b)). At this wreck site a bronze piece from amongst the 24 taken aboard the Levanter ships from the walls and the fortress of Palermo in April 1587 was also found, photographed but left *in situ*. It is a demi cannon, not a saker as has been written, mistaking the Sicilian *Cantaro* (79 kg) with the Spanish *Quintal* (46 kg). Thanks to its Sicilian weight mark *Cantara 20 – Rotoli 82* (1,654 kg) and with the help of Prof. Antonino Palazzolo (2007, 71–72), I was able to identify it as that cast by the Sicilian gunfounder Federico Musarra in 1549, bearing the figure of San Calogero, patron saint of Palermo (ASPA, TRP, NP, 2036, 8.V.1587). Only one exemplar of the medium-weight Genoese sakers seems to survive, that mentioned in this volume by Irena Radic Rossi, recently found off Brsecine near Dubrovnik, Croatia (Figure 6.5c). It lay close to the coast together with other broken bronze pieces that could have been scraps intended for re-melting or it

perhaps belonged to the equipment of a ship burnt down and sunk in that place. From the evidence of the pictures I received from its restorer, Renata Andjus, I think it may have been cast during the last two decades of the 16th century by Gio. Battista Gandolfo (Genoa c. 1535–1601). Indeed, the same monogram IB (for *Iohannes Baptista*) it has on the touchhole appears in a piece, dated 1591, where his whole name and surname written in Latin, *Io. Baptista Gandulphus*, are engraved on the base-ring, too (see Figure 6.10c).

Amongst ordnance aboard the *Galea Patrona* from the 1540s, two *Smerigli* also appear. In Genoa, this term then denoted both the smallest pieces that shoot stone balls or canisters and those that fired iron and, more frequently, lead shot weighing less than a *Libra* down to six *Once*. They could be either muzzle or breech-loaders as we learn from those two supplied by Dorino II Gioardi to the Genoese ship-owner Tomaso Bestagno in 1564 (ASG, NA, f. 1795, 15.V.1564): ... *smerigios duos metali et unum de uno pecio et alium a masculo de rubis novem singulo* ('... two bronze esmerils one made in a single piece and the other with a removable chamber, each one weighing nine *rubbi*', i.e. 71.5 kg). It is possible to match such a description, looking at



Figure 6.6. Genoese Smerigli petrieri (esmerils).

- a)** Muzzle-loading type possibly cast by Battista Merello in the 1550s, recovered from the Sciacca wreck (Photo: author).
- b)** Breech-loading type (16th century), maybe found off Carloforte, SW Sardinia, it is now kept in the War Museum at Rovereto, Trento (Photo: Museo della Guerra di Rovereto).

the images of two exemplars. One (Figure 6.6a), muzzle-loading, raised from the Sciacca wreck which I would date to the early 1550s, and another (Figure 6.6b) displayed in the Museo della Guerra at Rovereto.

Turning to the merchant ships, we have a certain number of archival records referring only to the early 1540s as the previous records and the later 16th-century state records seem to be lost. They deal with the *Revisiones* (inventories) of Genoese ships, in the *Maritimorum* collection of the Genoa State Archives (ASG, Mar, f. 1665–1666), in which we can observe a rather chequered situation. In order to make clear the lack of uniformity in the ordnance equipment, I show here some examples:

Navis Rubea (1540)

- 2 bronze cannons (of the old light-weight type weighing 27 *Cantara* each one)
- 2 bronze sakers (weight 14 *Cantara*)
- 3 bronze esmerils
- 28 iron bombards
- 12 iron esmerils

Navis Lercara (1540, captain Francesco Cibo Costa)

- 2 bronze demi culverins (weight 25 *Cantara*)
- 2 bronze demi cannons (weight 32? *Cantara*)
- 8 iron bombards
- 18 iron esmerils

Navis Angeli de Flisco (1541, owner Angelo Fieschi)

- 3 bronze demi cannons (no weight)
- 1 bronze saker (no weight)
- 12 iron bombards
- 1 iron *passavolante*
- 16 iron esmerils

Navis Doria (1541, owner Ambrogio Doria)

- 2 bronze demi cannons (no weight)
- 2 bronze sakers (no weight)
- 2 bronze falcons (no weight)
- 14 iron bombards
- 12 iron esmerils

Navis Rui secha (1544, owner and captain Leonardo Roisecco)

- 2 bronze pieces (weight 30 *Cantara*, maybe demi cannons)
- 2 bronze pieces (weight 22 *Cantara*, maybe demi culverins)
- 2 sakers (weight 12 *Cantara*)
- 8 iron bombards
- 8 iron esmerils

Navis Spinola (1544, owner and captain Luigi Spinola)

- 2 bronze pieces (weight 35 *Cantara*, maybe demi cannons)
- 10 iron bombards
- 3 iron *passavolanti*
- 33 iron esmerils

We do not know the tonnage rating of these vessels but, as they had bronze pieces according to the 1498 decree; it should have been larger than 480 tons and indeed in the

same papers we can find ships carrying only wrought iron ordnance which should have been smaller.

In 1546, trying to resolve such a confusion, the magistracy of the *Conservatores Navium* (Keepers of the ships) enacted a regulation that fixed number and total weight of the bronze pieces with which a merchantman had to be armed in proportion to its rating, at this time expressed in *Salme*. The *Salma* was a unit of dry volume (275 litres) used in Sicily to measure cereal [loads] and, as the Genoese ships freighted Sicilian corn above all else at the time, this system of rating had been adopted – fixing the rough equivalence 1 *Salma* = 4 Genoese *Cantara* (190.6 kg) (Gatti 1999, 86). Here are *Conservatores'* provisions (Calegari 1970, 91):

- More than 2500 *Salme* (over 475 tons): 5–6 pieces weighing 100 *Cantara* (4,765 kg)
- from 2000 to 2500 *Salme* (380–475 tons): 4 pieces weighing 80 *Cantara* (3,812 kg)
- from 1600 to 2000 *Salme* (300–380 tons): 3 pieces weighing 60 *Cantara* (2,856 kg)
- from 1400 to 1600 *Salme* (270–300 tons): 2 pieces weighing 40 *Cantara* (1,906 kg)

The ships rating less than 1400 *Salme* had to carry no bronze pieces as ‘*they have not a crew sufficient to handle ordnance ... and for this reason this ordnance could serve better to give weapons to the enemies than to defend these ships*’.

As we can note, the average weight of those pieces amounted to 20 *Cantara*, which is intermediate between a saker (13 C.) and a demi culverin bastard (27 C.). This last type of gun from that period, with the removal of the old thin wall ordnance, became the heaviest bronze piece aboard the Genoese merchant ships. The Genoese *Bastarda* fired a 12–15 *Libre* (3.8 – 4.8 kg) iron shot, had a calibre of about 110 mm and was long 25–27 calibres. Its form and size were quite similar to those of the French *coulouvrine batârde*, an exemplar of which was recovered from the Sciacca wreck. This piece, bearing a Genoese weight mark, shows Francis I’s salamander and should have been cast in the last years of his reign (1546–47). According to my researches it belonged to the equipment of the ship *San Juan* from San Sebastian, Biscay, and was purchased by the Genoese ship-owner Nicolò Zerbino in 1580 (Ridella 2005, 98). A fine exemplar of a Genoese demi culverin bastard is that raised off San Leone, Agrigento – Sicily in 2006 and now displayed in the archaeological park of the Valle dei Templi (Figure 6.7a). The monogram BS on its touchhole means that it should have been produced by Bartolomeo Sommariva (possibly around 1565), when he was about 25. Here I would briefly mention this gunfounder, who moved to Spain in the first 1580s, worked in Lisbon for the Armada in 1587 and then in Malaga from where in 1592 he went back to Lisbon. He was very much blamed by his contemporaries and by recent authors as a bad gunfounder, but the latter never ask themselves why he was not thrown out, and how he continued his career, taking up the prestigious direction of the foundry in Seville before 1608 from where, in the



a) Naval piece cast by Bartolomeo Sommariva, found off San Leone, Agrigento (Photo: Alessandra Nobili).



b) Naval piece found off Fornells, Minorca, now at the San Felipe Fort (Photo: Museo Militar de Menorca).



c) Fortress piece found off Fornells too, cast by Dorino II Gioardi (Photo: Museo Militar de Menorca).



d) Naval piece displayed in the Turkish Military Museum, Istanbul (Photo: Robert Smith & Ruth Brown).

Figure 6.7. Genoese demi culverins bastard.

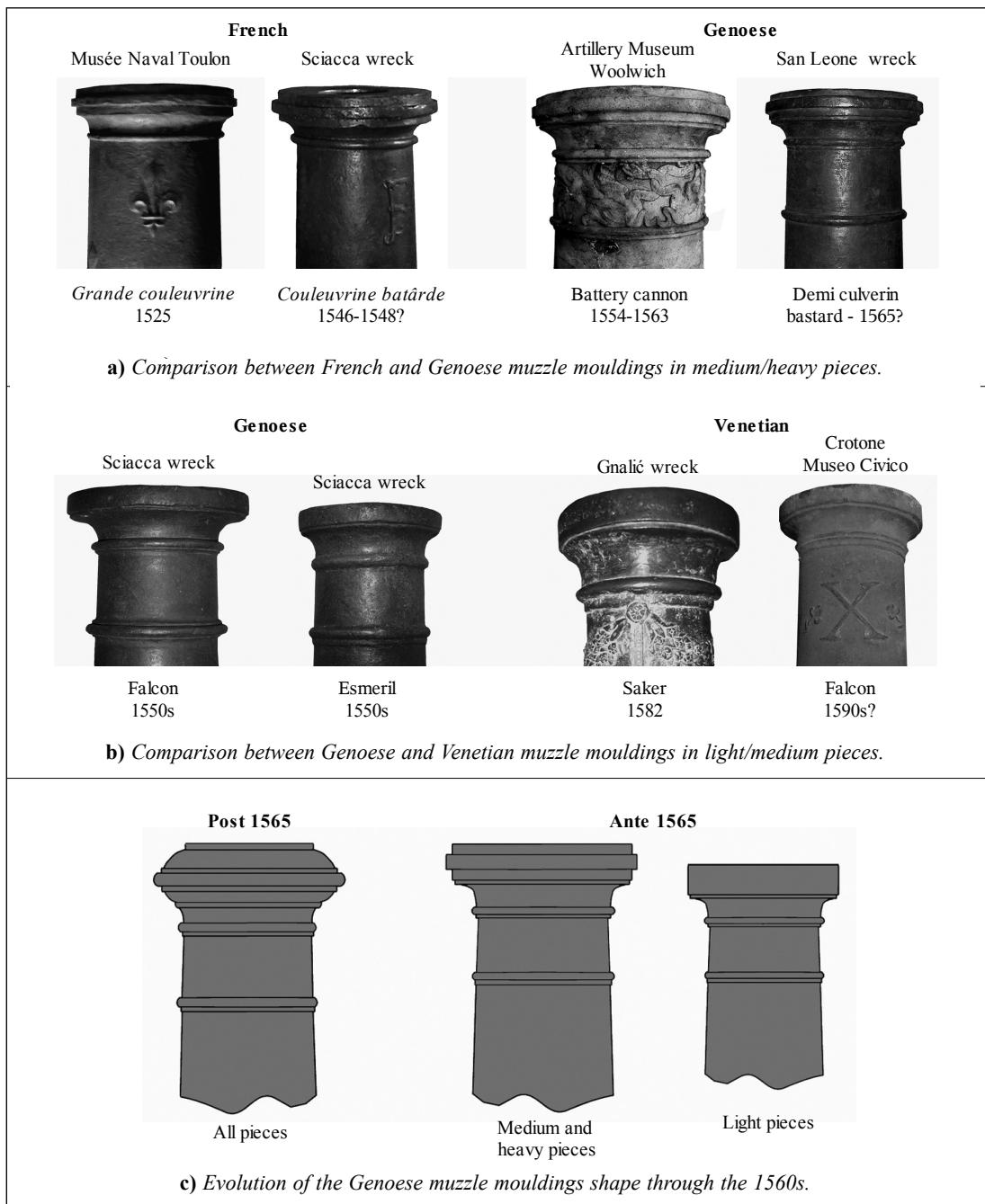


Figure 6.8. The Genoese muzzle mouldings in the 16th century.

following year, he addressed his *Memorial* to the king Philip III (Ridella 2009, 33–40).

In Bartolomeo's demi culverin we can note that the muzzle-mouldings show the archaic French-Genoese form shaped like a simple capital enriched with a square fillet (Figure 6.8a), while in the lighter pieces (sakers, falcons, etc.) the simple capital very similar to that present in the Venetian bronze guns till the 1670s (Figure 6.8b) appears to be prevalent. Now, in the Genoese ordnance that angled shape seems to be replaced, possibly after 1565, with a new rounded form (Figure 6.8c) and remained virtually unchanged until the mid-18th century together with the single reinforcement structure. So this difference can be used as a means of dating.

Two other Genoese demi culverins bastard were found off Fornells, Minorca, and are now kept in the San Felipe Fort, Mahon. They are a little spoiled but, looking at their muzzle mouldings, I think they could both have been cast before 1570. One of them (Figure 6.7b) shows the Genoese weight mark *Cantara 27 – Rotoli 62* (1,316 kg) in Arab numerals carved between the touchhole and the smooth coat-of-arms typical of the merchant sea ordnance. The other (Figure 6.7c) bears on the touchhole the D of Dorino II Gioardi and its cascable is moulded into the head of a lion. It has an illegible weight mark in Roman numerals on the base ring and is fitted out with dolphins (handles). Such evidence means that it represented a fortress piece taken aboard the ship wrecked off Fornells as sea ordnance



a) Demi culverin extraordinaria, possibly cast by Gregorio II Gioardi, which bears the Genoese weight mark Cantara 50 – Rotoli 65 (2413 kg). The eagle is the heraldic symbol of Palermo. Now in the Museo del Ejercito, Madrid (Photo: Museo del Ejercito, Madrid).



b) Saker cast by Dorino II Gioardi as the 'D' on the touchhole states. Its weight mark on the trunnion says Cantara 23 – Rotoli 61 (1125 kg). Now in the Castillo de la Mota, San Sebastian (Spain) (Photo: José Manuel Matés Luque).

Figure 6.9. Two Armada surviving cannon produced in Genoese foundries for the city walls of Palermo, Sicily, in 1575–76.

(Ridella 2005, 113, f. 13). This difference between these two demi culverins means that, at least in the second half of the 16th century, it is possible to distinguish a Genoese sea piece from a Genoese field piece and now I think we can properly discuss a Genoese naval ordnance. Other examples of field artillery taken aboard some ships are represented by two pieces that I found in Spain. They are a demi culverin *extraordinaria* (very long) cast, possibly, by Gregorio II Gioardi in 1575 displayed in the Museo del Ejercito, Madrid (Figure 6.9a) and a saker produced the

following year by his cousin Dorino now in the Castillo de la Mota at San Sebastian/Donostia (Figure 6.9b). They belonged to a supply of at least 50 pieces (battery cannon, demi cannon, demi culverins, sakers and *Petrieri*) made by some Genoese gunfounders (Dorino II and Gregorio II Gioardi, Gio. Battista Gandolfo and the brothers Sommariva) for the city walls of Palermo and its Spanish fortress, the *Castel a Mare*. Thanks to their Genoese weight marks engraved on the right trunnion, and with the help of Prof. Palazzolo, I was able to understand that they were taken

aboard the six ships embargoed by the Spaniards in Sicily to form the Armada Levanter Squadron. Possibly they were the only pieces of the 24 (11 of Genoese manufacture), which were taken from Palermo in 1587 (ASPA, TRP, NP, 2036, 8.V.1587), to go back to Spain after the failed expedition against England. One, perhaps the only one, of those Levanter ships to survive from the expedition was the Genoese *Santissima Trinità di Scala* (Giacomo Scala was her former captain, who died in Gibraltar and was replaced by Francesco Isola, and the owner was the Genoese nobleman Nicolò Lomellini), which entered the port of Santander, northern Spain, very badly battered. She was dismasted and lacking the boat and four anchors of the six she had when she sailed; possibly she had lost them at Gravelines when the Armada was attacked by the English fire ships (I found the report of her purser Battista Gabrielli in ASG, NA, f. 3167, 10.VI.1606).

Another Genoese naval demi culverin is kept in the Turkish Military Museum (Askeri Muze), Istanbul. In its picture (Figure 6.7 d), provided to me by Ruth Brown, we can read the weight mark *Cantara 26 – Rotoli 75* (1,275 kg). Its shape is quite similar to that of the contemporaneous Venetian pieces save for the iron handle – possibly an extension of a crown-piece holding the bore mould still during the casting and used also as a rear sight – the remains of which are recognizable in the two rusty square bulges present in the base ring peculiar to the French-Genoese system (see Figure 6.9b).

During the same period (1550s–1570s), on the Genoese merchant ships, the obsolete iron bombard began to be replaced with a particular type of bronze guns. They were muzzle-loading chambered pieces deriving from the old *Cannoni petrieri* (end 15th–early 16th century) and then called simply *Petrieri* in the inventories. This category had a large diffusion in the Genoese ordnance also through the whole 17th century mainly on the city walls and strongholds as, owing to their small dimensions, they could easily be worked into the narrow casemates placed in the sides of the bulwarks. From this position they could fire stone or canister shot, sweeping the walls and enfilading the enemy infantry in attack. Three category of *Petrieri* were produced:

- the heavy ones firing a 15–18 *Libre* (4.8–5.7 kg) stone shot, weighing 14–20 *Cantara* (670–860 kg) and having a bore diameter that can be estimated as 160–170 mm.
- the medium, 9–12 *Libre* (2.9–3.8 kg), weight 7–10 *Cantara* (330–480 kg), bore diameter 135–155 mm
- the light, 6 *Libre* (1.9 kg), weight 4–5 *Cantara* (190–240 kg), bore diameter 120 mm.

Aboard the merchantmen vessels, the medium *Petrieri* were mainly employed, like the two (Figure 6.10 a), dated c. 1570, recovered from the *Juliana* wreck (McElvogue 2002, 38–40) and the couple recently found near the Grebeni islet, Vis island – Croatia (Radic Rossi, pers. comm.). These last (Figure 6.10b), considering a particular piece of evidence about them, could have been cast by Francesco Sommariva, Bartolomeo's brother, maybe in the

1590s and one of them shows the weight mark *Cantara 9 – Rotoli 53* (454 kg). The light *Petrieri* were placed mostly in the smaller boats like, for example, a single piece in the oared *Fregate coralline* engaged in the coral fishing along the coasts of Corsica and Sardinia (Gatti 1999, 211). Off this last island, possibly near Calasetta or Porto Torres, was found an exemplar of this kind was found (Figure 6.10c) cast by Gio. Battista Gandolfo in 1591 (Ridella 2008, 300, f. 11) and marked *Cantara 4 – Rotoli 84* (231 kg). Another two light pieces (Figure 6.10 d) found in 1907 near the *Molo Vecchio*, the Genoese old jetty, at present displayed in the Museo del Mare “Galata”, Genoa, should belong to the same period. Their weight marks are *Cantara 4 – Rotoli 96* (236 kg) and *Cantara 5 – Rotoli 6* (241 kg).

We can find two medium/heavy *Petrieri* in the inventory of the ship *La Trinità* rating 4,500 *Salme*, dated 9th July 1579 (ASG, NA, f. 3014, 9.VII.1579):

- 2 *Mogiane* (heavy sakers), weighing 16 *Cantara* each.
- 2 *Bastarde* (demi culverins bastard), 21 *Cantara* each
- 2 *Pedrieri*, 14 *Cantara* each
- 1 *Sagro* (really a heavy falcon), *Cantara 10 – Rotoli 25*
- 2 *Sagri* (really heavy falcons), 8–9 *Cantara* each
- 2 *Falconetti* (falconets), 4 *Cantara* each
- 2 *Pedreri alla veniciana* (breech-loading swivel guns with bronze barrels and iron *braghe* (chamber holders), 4 *Cantara* each
- 1 *Sagro di ferro coratto* (cast iron short saker) 9 *Cantara*
- 2 *Bombarde* (wrought iron bombards)

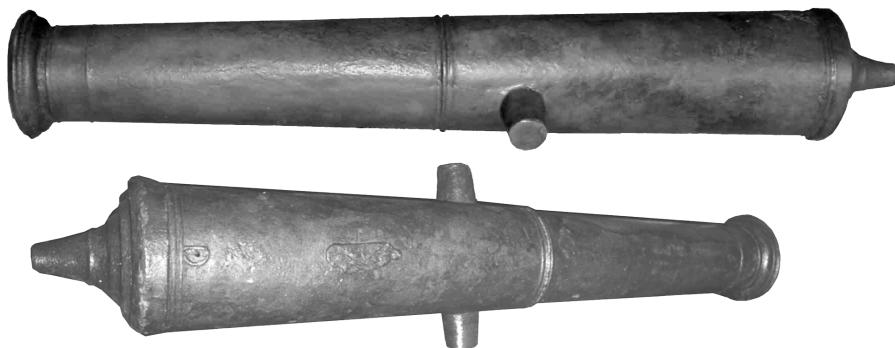
Here we can see that the old wrought iron ordnance has almost entirely disappeared while the first cast iron pieces begin to appear. The total weight of the bronze ordnance (13 pieces) exceeds 145 *Cantara* (6,900 kg) and is compatible with the rating of the ship. It is also evident that the falcons (here improperly called sakers), had become heavier than the first types, as is verifiable in the exemplar from the Sciacca wreck that I dated to the 1550s and ascribed to Battista Merello and his brother-in-low Dorino II Gioardi (Ridella 2005, 104).

In the same period a smaller ship, the *Santa Maria della Grazia* (2,600 *Salme*), had a heavier and more uniform equipment (Gatti 1999, 333) composed of 6 *Bastarde* (22–23 *Cantara* each), 4 *Pedrieri* (9–10 *Cantara* each), 3 *Smerigli* (swivel guns firing lead/iron shot, 3.5 *Cantara* each), 2 *Bombarde* (7 *Cantara* each).

The maximum in bronze ordnance equipment had to be that reached aboard the *Nostra Signora Incoronata* (alias *La Coltellera* – 820 tons) which in 1594 carried 6 demi culverins, 4 heavy *Petrieri*, 4 medium *Petrieri*, 2 heavy sakers, 9 swivel guns, with a total weight of 18,500 kg (ASG, NA, f. 3860, 1.III.1594).

The situation of the Genoese galley ordnance from the eve of Lepanto to the 1590s

From an archival record dated 18th July 1560 we can consider the ordnance then equipping the galley *Capitana*



a) Medium weight pieces from the Juliana wreck, the lower showing the 'D' of Dorino II Gioardi (Photos: Robert Smith and Jim Stapleton).



b) Couple of medium weight pieces found off Grebeni, Island of Vis, Croatia (Photo: Danijel Frka).

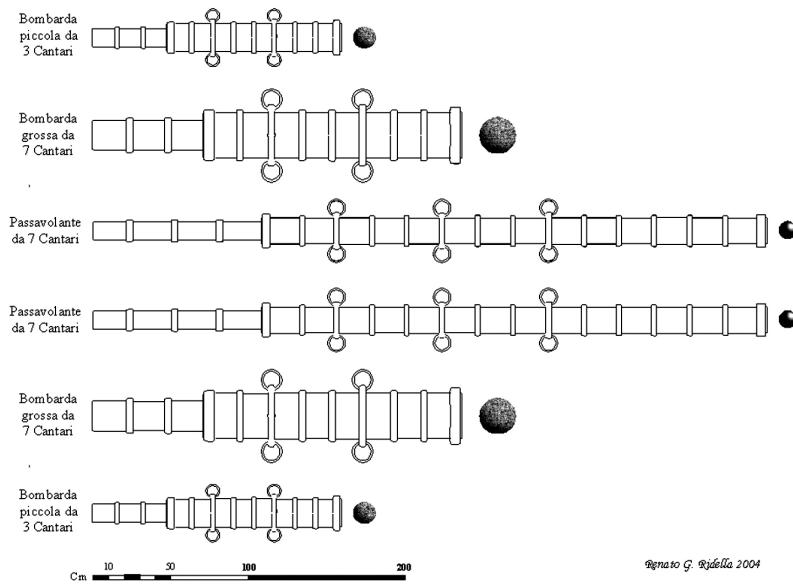


c) Light piece, cast by Gio Battista Gandolfo in 1591, found in the sea of Sardinia (Photo: Mario Galasso).

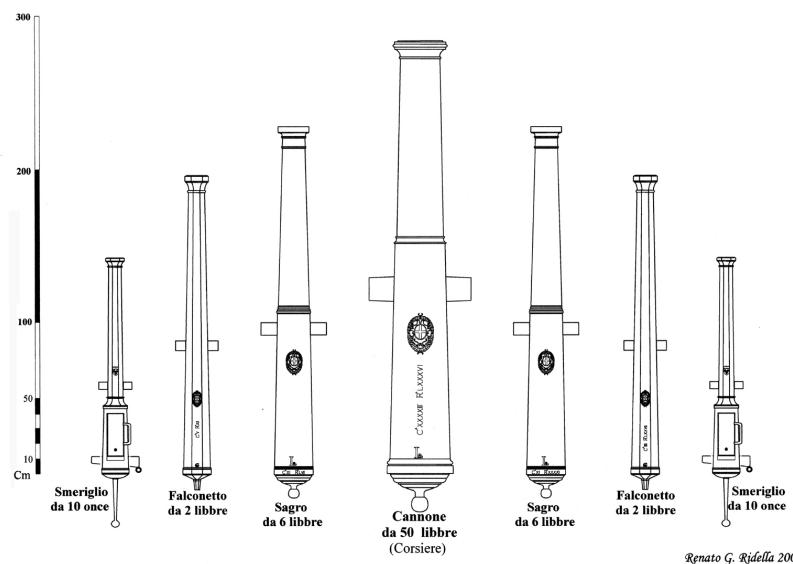


d) Couple of light pieces found off the port of Genoa in 1907 (Photo: author).

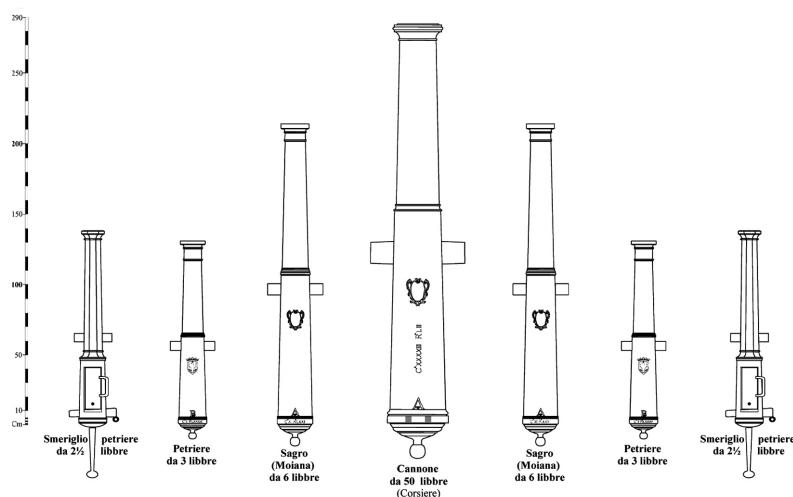
Figure 6.10. Genoese naval Petrieri.



a) Hypothesis about the wrought iron equipment toward the end of the 15th century.



b) Reconstructive drawing of the ordnance equipping the galley Capitana (flagship) of Genoa in 1560. The ordinary galleys, like the vice-flagship (Patrona) in the 1540s, lacked the two falconets.

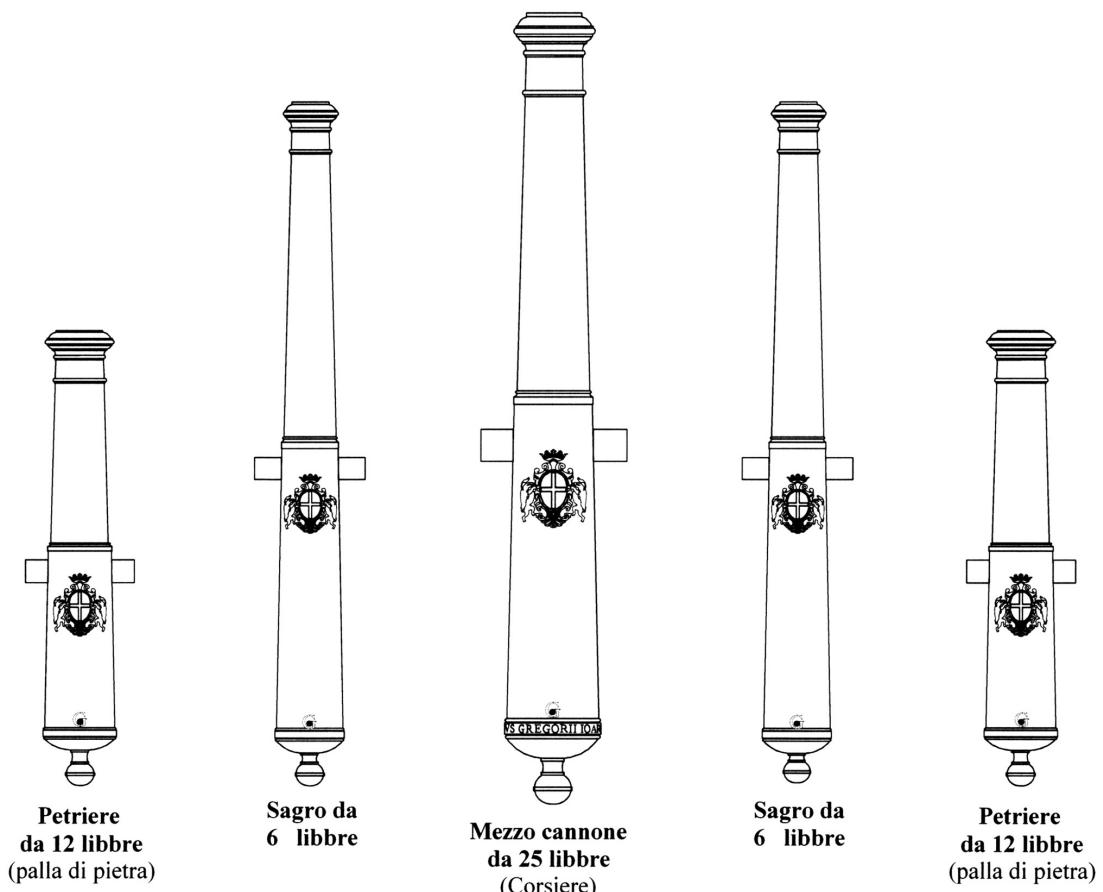


c) Reconstructive drawing of the ordnance of Gio. Andrea Doria's galley Donzella in 1582.

Figure 6.11. Development of the ordnance aboard the Genoese galleys from the end of the 15th century to the 1580s.

(flagship) of Genoa (Figure 6.11b), when she was sold to the Duke of Tuscany and given to his commissioner Antonio Martelli on the shore of Castagneto, Leghorn (ASG, MG, f. 1, 18.VII.1560). This inventory, though presenting an incorrect terminology as it was possibly written by an unskilled clerk, shows that she carried 5 main pieces. As we know that the *Capitane* were more heavily armed in comparison with the ordinary galleys, we can deduce that these last lacked the two falcons and were in the same situation as in the early 1540s (supra 43). Niccolò Capponi (2006, 185–190), in his analysis of the ordnance of the Christian galleys fighting in the battle of Lepanto (1571), underlines this lighter equipment peculiar to the *Ponentine* ones (Western: Spanish, Genoese, Tuscan and Papal) in comparison with that of the *Levantine*, or Venetian ones,

on which the pieces, particularly the swivel guns, were more numerous. The inventories of the *Capitana* and the *Patrona* of Genoa in 1570–71 (ASG, MG, f. 1, 31.VIII.1570, 9.III.1571) and those of the four galleys sold to the Spanish Crown by the Lomellini in 1575 (evidence that I first reported to Capponi: ASG, NA, f. 3150, 23.IV.1575), confirm his assertion. But it is evident that a little after this period, the Genoese galleys began to strengthen their equipment, as we learn from the sale contract for ten of Gio. Andrea Doria's galleys purchased from him by the Spaniards in 1582 (ASG, NA, f. 3156, 3.I.1582). Nine of them, like for example the *Donzella* had actually increased their armament to five main pieces. Part of the inventory, written in Spanish and referring to this galley, says:



a) Reconstructive hypothesis about the ordnance of a Genoese public galley in the 1590s (after Ridella 2004b).



b) Naval demi cannon cast by Francesco Sommariva around 1590, weighing Cantara 42.90 (Kgs 2044). At present it is displayed in the Museo del Ejercito, Madrid (Photo: Museo del Ejercito, Madrid).

Figure 6.12. Evolution of the ordnance aboard Genoese galleys toward the end of the 16th century.

Artilleria

- *Un cañon de cruxia, con una A sobre el fogon sin otra ninguna señal, que peso quarenta y cuatro quintales (Cantara) y cincuenta y tres rotulos ...*
- *Una moyana (saker), con el mismo señal que el cañon, y escrito en guarismo onze quintales (Cantara) y veinte y seis [rotulos] ...*
- *Otra moyana (saker), con la propia señal que el cañon, escrito en guarismo onze quintales (Cantara) y setenta y dos [rotulos] ...*
- *Dos pedreros, con una señal de B sobre el fogon en ambos, y con las armas Doria, que pesaron siete quintales (Cantara) y setenta y seis rotulos (both) ...*
- *Dos esmeriles, sin ninguna señal octabados, con sus mangos de hierro, y cuatro masculos, pesaron, el metal (bronze) siete quintales (Cantara) y quarenta rotulos y el hierro cincuenta rotulos (both) ...*

From this data I propose this reconstruction (Figure 6.11c).

It must also be remembered that the Republic and the most important Genoese galley owners, like the Lomellini and Doria, had at their disposal sizeable spare equipments that could serve not only to arm new ships but also to increase the ordnance of those already at sea. Indeed, when we learn that in 1570, Bartolomeo Sommariva cast more than 261 *Cantara* (12,440 kg) of bronze pieces (we do not know how many pieces: Merli, Belgrano 1874, 50), nominally for Gio. Andrea Doria's *Capitana nuova* (new flag galley); we can then calculate that with such a weight of ordnance, another *Capitana* or two ordinary galleys could easily be equipped, too. Besides we know that the same Gio. Andrea, at his great-uncle Andrea Doria's death on 25th November 1560, had also inherited 15 spare pieces weighing in total 386 *Cantara*, sufficient to equip five new galleys (Borghesi 1996, 193, 211).

In the 1590s a rather substantial change, that I had wrongly attributed to the 1570s (Ridella 2004b, 28, f. 1), had to happen (Figure 6.12a). Actually, up to now, we could understand that change only by comparing more recent (early 17th century) records (ASG, MG, f. 4, 9.VII.1608) with surviving pieces of ordnance. It consisted, above all, in the replacement of the old 50 *Libre* centreline cannon with a modern 25 *Libre* reinforced demi cannon (Figure 6.12b). As this last piece – with its thicker walls and greater length – weighed only a little less than the previous piece (certainly more than 40 *Cantara*) the frame of the galley did not need to be modified. We can make some simple suppositions about the reasons for this measure. The new centreline piece had a longer range, could stand a higher rate of fire and be reloaded more quickly than the 50 *Libre*. These performances allowed a galley to hit a sailing warship, over and over again, while holding itself out of range from the ship's much more numerous, but less powerful, guns. Of the complementary pieces the two 6 *Libre* medium sakers remained in use accompanied with two 12 *Libre* medium *Petrieri*. Except for the centreline piece, this arrangement seems to mirror that, of almost forty years earlier, reported in 1552 to the Duke of Florence by an emissary of his sent to Genoa in order to gather

information about Andrea Doria's galleys (Borghesi 1970, 159). The respective ordnance equipment – 1 *cannone*, 2 *sagli*, 2 *cannoni petrei* and 4 *smerigli piccoli* – could have been simply theoretical as I never found a similar one in the actual inventories of the following years.

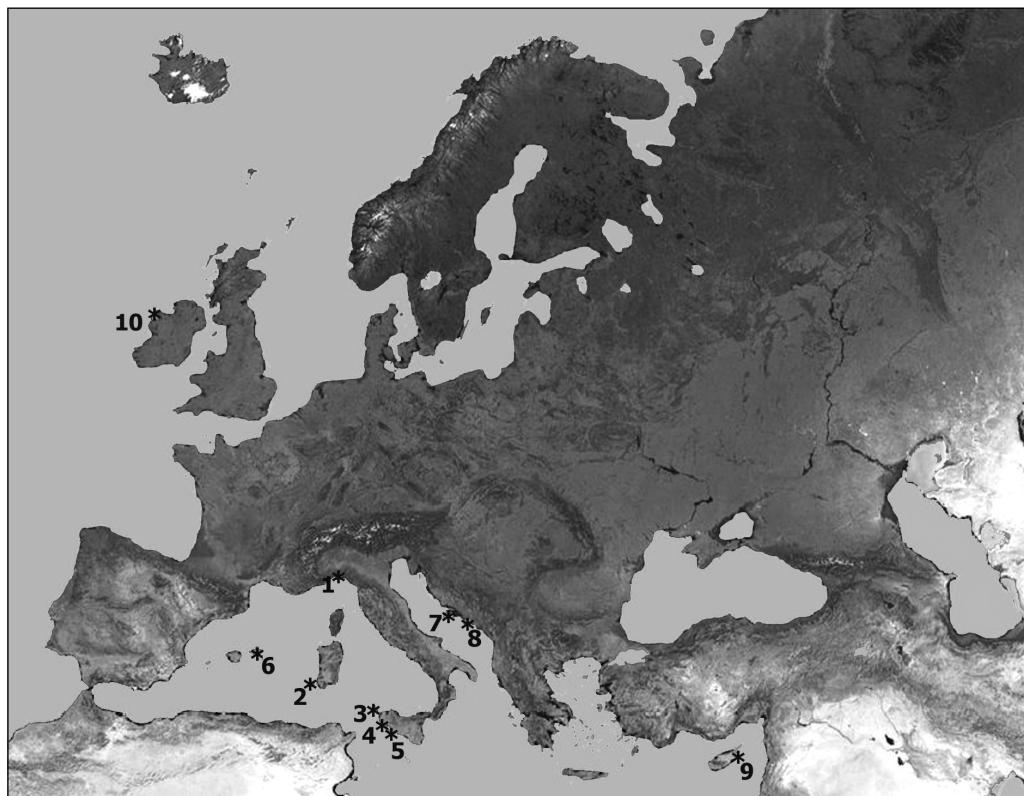
Coming back to the 1590s, surprisingly in this case, the public galleys were the first to be refitted with this combination of ordnance that remained practically unchanged through the following two centuries. Then the private ship-owners followed this example. In 1629, in an estimated budget to equip four galleys that had to be fitted out for the King of Spain, the Pallavicini expected to have to purchase for each of them (AADG, AP, f 19, n 31):

- One centreline demi cannon, weighing 40 *Cantara* and firing a 25 *Libre* shot;
- two sakers, weighing 12 *Cantara* and firing a 6 *Libre* shot;
- two *Pedreri*, weighing 8 *Cantara* and firing a 10 *Libre* (stone) shot.'

And now there is another little known fact. When the English established a naval base in Tangier, Morocco, which they had received in 1662 from the Portuguese, they not only asked the help of Genoese technicians for the building of the outer breakwater (Mannoni 1991, 37) but to also form a little squadron of galleys in order to patrol the neighbouring coasts. They actually purchased two hulls, one in Leghorn and the other in Genoa (Giacomone Piana 1997), and for the respective ordnance turned to Domenico Ramone, then serving the Republic as a public gunfounder. Indeed, they did not have at their disposal brass naval pieces with the performance of the Mediterranean galley ordnance. Besides, we know that on 31 July 1682 the Genoese *Magistrato d'Artiglieria* (Magistracy of the Ordnance) asked for the return of two heavy falcons (*Cantara* 9.56 and 9.52) and two medium *Petrieri* (*Cantara* 10.50 and 10.30) lent in 1674 to His Majesty's galley commander, the French Jean Baptiste du Teil, pieces that then were still in Tangier (ASG, FF, MA, f. 361, 31.VII.1582).

Fortune and decline in the Genoese manufacture of bronze naval ordnance

Analyzing archival and bibliographic data in order to reconstruct the productive activity of the 16th-century Genoese gunfounders I was able to establish that they were very busy in the first three decades of the second half of this century. That has to be imputed mainly to some large state orders like that from the Republic, engaged in the reconquest of Corsica in the years 1553–1559, and then in the equipping of the regained towns and fortress (see Ridella 2006). Besides, in the period cited there were also sizeable Spanish orders: in 1557–59, 142 pieces for the city walls and fortress of Milan (Ridella 2005, 105–106); in 1571–72, an undefined number of pieces for the Spanish strongholds in the *Stato dei Presidi* (Tuscany) and for the Kingdom of Naples (Martinelli 2006, 96–97; Capasso 1896, 418–419); and in 1575–76, at least 50 pieces for



1* Genova /Molo Vecchio: n. 2 Light *Petriere*; 2* Carloforte e Calasetta (CA): n. 1 Esmeril (stone), n. 1 Light *Petriere*; 3* Favignana/Lido Burrone (TP): n. 1 Falconet; 4* Sciacca/Coda di Volpe (AG): n. 1 Falcon, n. 1 Medium *Petriere*, 1 Esmeril (stone); 5* Agrigento/San Leone: n. 1 Demi culverin bastard; 6* Minorca/Fornells (Balearic Islands - Spain): n. 2 Demi culverins bastard; 7* Vis [Lissa]/Grebeni (Croatia): n. 2 Medium *Petriere*; 8* Dubrovnik/Brsecine (Croatia): n. 1 Medium saker, n. 1 Medium *Petriere* (broken); 9* Famagusta Bay/Cyprus: n. 1 Heavy saker; 10* Sligo Bay/Streedagh Strand (Ireland): n. 1 Heavy saker, n. 2 Medium *Petriere*.

Figure 6.13. Locating map of sea finds concerning bronze pieces of ordnance from Genoese production.

the city walls and fortress of Palermo (ASG, NA, f. 3150, 30.III.1575, 2.V.1575, 4.V.1575, 26.V.1575, 17.VI.1575; ASPa, TRP, NP, 2382, 1575–76). But this is not sufficient to completely explain the presence in Genoa of seven foundries operating in the early 1570s as attested by a deed of partnership. It was dated 20th March 1572 and includes the seven Genoese gunfounders, Alessandro, Dorino II, Gregorio II and Stefano Gioardi, Giacomo Merello, Gio. Battista Gandolfo and Bartolomeo Sommariva, each one running his own workshop (ASG, NA, f. 2897, 20.III.1572). In my opinion, in this period, the demand that allowed the activity of such a number of manufacturers can be explained only with a sizeable need for naval ordnance.

From notarial records we learn that not only Genoese ship-owners turned to these founders in order to equip their vessels but also foreign ones, like Spanish and Ragusan (from Ragusa/Dubrovnik, Croatia), who frequented the port of Genoa for their trades. See for example, respectively, the medium saker, produced by Dorino II Gioardi in 1582, purchased by Pedro Gonzales from Majorca (ASG, NA, f. 3156, 13.III.1582) and the four pieces cast by Bartolomeo Sommariva in 1571 for the Ragusan ship of Francesco Antonio di Marino Skocibucha (ASG, NA, f. 1800, 21.II.1571). For these reasons, and considering the number of Genoese bronze pieces recovered from 16th century wrecks (see Figure 6.13), it is not rash to think that Genoa

in this period was one of the most productive centres of merchant sea ordnance in the Mediterranean Sea.

But this favourable situation was not destined to last for a long time. The cast iron ordnance, English or western German marketed through Amsterdam – the first exemplars of which began to appear in the Genoese inventories early in the 1580s, replaced the bronze ones more and more quickly aboard the merchant ships. That was only due to reasons of cheapness as an iron gun then cost one fifth of a bronze one of the same weight (Cipolla 1969, 29–32). So at the end of the 16th century, almost all the long range pieces should have been of cast iron and in the first decades of the 17th, no bronze ones could be found aboard a Genoese merchantman (Gatti 1999, 343–344), save for some swivel guns.

For reasons of productive economy, more than for technical ones, it did not however become profitable to set up iron blast furnaces in the territory of the Republic of Genoa, where they continued to use the less expensive, in terms of charcoal, Ligurian *basso fuoco* (low fire) system (Calegari 1979; Baraldi 2005). But the high temperatures needed to melt and cast the iron could not be reached by means of this method. So Genoa continued to produce only bronze ordnance, but the number of gunfounders and workshops were reduced to one in 1616, when the new public foundry had been built.

Appendix

Genoese weight units

Cantaro (100 rotoli)	= 47.649 kg
Rotolo (1½ libre)	= 476.49 g
Libra (12 once)	= 317.66 g
Oncia	= 26.47 g

Sicilian weight units

Cantaro (100 rotoli)	= 79.432 kg
Rotolo (2½ libre)	= 794.32 g
Libra (12 once)	= 317.73 g
Oncia	= 26.48 g

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Archivio Pallavicini.
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- ASG, CGF Archivio di Stato di Genova, *Camera di Governo e Finanza*.
- ASG, FF, MA Archivio di Stato di Genova, *Fondo Foglietta, Magistrato d'Artiglieria*.
- ASG, Mar Archivio di Stato di Genova, *Maritimorum*.
- ASG, MG Archivio di Stato di Genova, *Magistrato delle Galee*.
- ASG, NA Archivio di Stato di Genova, *Notai Antichi*.
- ASPA, TRP, NP Archivio di Stato di Palermo, *Tribunale del Real Patrimonio*, Numerazione Provvisoria

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