HISTORICAL AND RECENT DATA OF SICILIAN TRAPS: THE COMPLEXITY OF DATA RECOVERY AND INTERPRETATION

A. Pagá García[1], A. Di Natale[1], S. Tensek[1], C. Palma[1]

SUMMARY

One of the main activities of the ICCAT GBYP is data recovery and most of the efforts have been devoted to traps, the gear with the longest history. After 7 years of data recovery, a considerable amount of information and a data series going back to 1512 were produced, now the data statistics to be used by the SCRS. At this point, to avoid biased interpretations of the accumulated data, it is important to show what is behind the numbers, the complexity of the situations over the many centuries and the limits for interpreting the data. For this purpose, we used as an example the data from the Sicilian traps, the most documented and even the most complex series.

RÉSUMÉ

La récupération des données constitue l'une des principales tâches de l'ICCAT-GBYP et la plupart des efforts ont été consacrés aux madragues, l'engin présentant l'historique le plus long. Après avoir récupéré des données pendant sept ans, ce qui a produit une quantité considérable d'informations et une série de données remontant à 1512, le SCRS a commencé à utiliser les données statistiques. À ce stade, afin d'éviter les interprétations biaisées des données accumulées, il est important de montrer ce qui se cache derrière les chiffres, la complexité des situations au cours des nombreux siècles et les limites d'interprétation des données. À cette fin, nous avons utilisé comme exemple les données des madragues siciliennes, la série la plus documentée et la plus complexe.

RESUMEN

Una de las principales actividades del ICCAT GBYP es la recuperación de datos y la mayor parte de los esfuerzos se han dedicado a las almadrabas, el arte que tiene la historia más larga. Tras siete años de recuperación de datos, en los que se ha producido una cantidad considerable de información y una serie de datos que se remonta a 1512, ahora, el SCRS empieza a utilizar dichos datos. En este punto, para evitar interpretaciones sesgadas de los datos acumulados, es importante mostrar lo que está detrás de los números, la complejidad de las situaciones durante muchos siglos y los límites para la interpretación de estos datos. A este efecto, utilizamos como ejemplo los datos de las almadrabas sicilianas, la serie más documentada e incluso las más compleja.

KEYWORDS

Bluefin tuna, tuna trap, data collection, fish catch statistics, data mining, Mediterranean Sea, Sicily, historical data

[1] ICCAT, GBYP, Corazón de María, 8, 6th floor, 28002 Madrid, Spain.

1. Introduction

One of the main activities of ICCAT GBYP, as decided by the Commission, is the data mining and data recovery. This activity was carried out every year, since the beginning of the programme, with different intensity and objectives, according to the needs and priorities recommended by the GBYP Steering Committee and the opportunities for finding the data. A constant activity over the years was the recovery of the trap data, because this fishery is the oldest human industry, with about 27 centuries of activity, mostly in the Mediterranean Sea.

This allowed to build the largest data base for one single marine species so far, with trap information going back to 6 centuries b.C. and trap data from 1512 onwards (Di Natale *et al*., in press). The GBYP, conscious of the relevance of this fishery, included among the first activities also a Symposium on Trap fisheries for Bluefin Tuna, which was held in Tangier (Morocco) in May 2011 (Anonymous, 2012)[2].

The trap data recovered so far are of several types. The first activity was the recovery of the huge literature related to tuna traps (Di Natale, 2012), a work which is still on-going; at the date of this paper, the tuna trap bibliography includes a total of more than 1,700 titles, possibly the largest literature on a single fishing gear so far. The basic information is about the distribution of the traps since very ancient historical times, trying to locate them using archaeological sources concerning both sites where tuna salting plants were located or places where coins with tuna indicate the relevance of this activity from the local economy (Di Natale, 2013; Cutroni Tusa, 2013). Then the data mining provided data about individual traps (yearly catch, catch by fishing operation, and even size or weight frequencies when available). Of course, being the data dispersed in many hundreds of archives and papers in several countries, the data mining was a very difficult activity which involved several scientists who carried out challenging studies, exploring many archives. This data recovery activity produced a huge quantity of data, but which covers only partly the complex universe of the many traps over the centuries. As a matter of fact, data were recovered from a total of 207 traps in the Mediterranean and in the closer East Atlantic area, and all data series are partly or largely incomplete, because of the many stories behind each single trap, the many changes in the ownership and the various historical facts over the centuries, which sometimes dispersed the archives and the data.

The lecture of the trap data is therefore not easy and this was pointed out even at the early beginning of the programme (Di Natale and Idrissi, 2012). Now, at a most advanced stage and after so many years of GBYP efforts for the data mining, it is possible to provide a more accurate and specific reading key for a better understanding of the trap data.

2. The problems behind the data: the Sicilian traps as an example

Whenever a summary of the ICCAT GBYP data recovery activities is provided, the total numbers covers a complex reality of the data, particularly those concerning the very long series of the trap data. Whenever a scientist approaches these data for detailed analyses, then it is easy to discover the many components, the limits and the opportunities, but when only total caches are used, then the data understanding can be seriously biased.

Being conscious of this situation, and having the need to better explain it to the scientific community, it was decided not to make a complex and comprehensive study, but to use a data set as an example of the main constraints linked to the data. For this purpose, the Sicilian traps were selected, because they are surely the most documented ones over the centuries, even if the data are not always available or easy to find.

Therefore, we carried out some additional studies for better describing the Sicilian trap universe since ancient historical times and provide the tools for improving the general understanding in an easy manner.

The first part is related to the tuna trap distribution over the centuries, which was very variable in number and in the concentration along the coastline. After examining a huge bibliography and particularly some important reference works (Al-Idrisi, 1154a, 1154b; Avolio Di Paola, 1805; D'Amico, 1816; Pavesi, 1889; La Mantia, 1901; Parona, 1915; Gamberini, 1916; Bresh, 1981; Idrisi, 2013; Tricamo, 2015), it was possible to obtain the distribution of the tuna traps in Sicily over the various centuries. From a practical reason, the maps are showing the distribution of the traps for the full classical period (V b.C.- V a.C), and then, after a temporal gap of about 6 centuries for which the information is not available, for the XII century, then for the late Middle Ages as a whole (XIII to XV century) and finally century by century.

[2] ICCAT produced a special volume for the Symposium on Tuna Trap Fishery, available on http://iccat.int/Documents/CVSP/CV067_2012/colvol67.html

The maps (**Figure 1** to **Figure 9**) clearly indicate the distribution and location of the Sicilian traps over the centuries, demonstrating the variability in number and distribution, up to the last image of the XXI century, with the last two Sicilian tuna traps (S. Giuliano Palazzo, which had the last fishing activity in 2003 and Favignana, which closed in 2006). **Figure 10** shows the relevance of the Sicilian traps, compared to the total number of traps in Italy in the period 1885-1930, together with the annual variability in number (Gangemi, 2011).

The detail about the activities over the centuries of each Sicilian traps, with the individual location, based on various documents, is provided on **Table 1**. As it was mentioned before, within the same century some traps were active just for short periods.

In total, ICCAT GBYP recovered so far data from 54 Sicilian traps, but the number of Sicilian traps over the centuries was at least 153 (the maximum we have been able to detect so far).

The data recovered by ICCAT GBYP up to Phase 5 for the Sicilian traps have been already included in the ICCAT Bluefin tuna data base, while the last data from Phase 6 will be included in 2017, according to the procedures. **Figure 11** provides the overview of the different data series by trap, over the years.

3. Discussion

The data presented in this paper are clearly showing both the limits and the opportunities provided by the data mining of tuna trap fishery. This overview is now very relevant, because finally the data collected so far have been duly included in the ICCAT Bluefin tuna data base, creating the longest data base for a single marine species so far, with data going back to 1512 (Di Natale 2015; Di Natale *et al*., in press).

Even if the effort for recovering these data was huge, the example provided by just the Sicilian data makes very clear what is behind the data and how they can be interpreted, particularly when looking at total Bluefin tuna removals in ancient times.

The number of tuna traps over the centuries was very variable even within each century (see **Figure 10** for discover the annual variability in the period 1885-1930), because the activities were affected by many factors (Di Natale and Idrissi, 2012), including changes in ownership, pirate activities, wars, invasions, economic problems, earthquakes, other natural events, low catches due to natural fluctuations or displacements of the Bluefin tuna population and many other factors. Each trap has its own history, which is short or very long.

The difficulties for documenting the activities are many and they are even more for finding the data, because they are widely spread in many archives and several were already lost for ever. Therefore, the historical data series are often scattered or short (**Figure 11**), depending on the history of each trap, the availability of the documents and other factors.

The productivity of the tuna traps in Sicily was very high, in general and compared to the cumulative production of the Italian traps. **Figure 12** provide an example of the total official catches of Bluefin tuna for the Italian tuna traps in the period 1885-1930, showing also the catches of the Sicilian traps (Gangemi, 2011). Catches were those officially reported, therefore possibly lower than the real ones, due to tax motivations, as reported by the Gangemi (2011); even under this underestimation perspective, Italian tuna trap catches were very high in general, reaching a peak of over 8,000 tons in 1906.

This paper shows very clearly that, besides a huge data mining effort, the number of Sicilian traps for which data are available so far represents about 35.3% of the total number of traps which have been active in this region over the centuries. Even if possibly some of the most important traps are currently included, it is obvious that the total catch attributed to tuna traps over the centuries can show only an underestimated figure (**Figure 13**). This is very important for better interpreting even this figure and for better assessing the total Bluefin tuna removals from the natural population.

Bibliography

Al-Idrisi al-Qurtubi al-Hasani al-Sabti A.A.A.M., 1154a, Tabula Rogeriana.

Al-Idrisi al-Qurtubi al-Hasani al-Sabti A.A.A.M., 1154b, De geographia universali or Kitāb Nuzhat al-mushtāq fī dhikr al-amṣār wa-al-aqṭār wa-al-buldān wa-al-juzur wa-al-madā' in wa-al-āfāq, Rome (latin translation of the original work written in Arabic around 1154).

Anonymous, 2012, ICCAT GBYP Symposium on Trap Fisheries for Bluefin Tuna. Collect. Vol. Sci. Pap. ICCAT, 67: 1-398.

Avolio Di Paola F., 1805, Delle Leggi Siciliane intorno alla Pesca. Reale Stamperia, Palermo : 1-239.

Bresc H., 1981, La pêche et les madragues dans la Sicile médiévale. In : L'homme méditerranée et la mer. Jerba, avril 1981. Institut National d'Archéologie et d'Art de Tunis : 166-180.

Cutroni Tusa A., 2013, Lampedusa, dalla preistoria alla moneta. Sicilia Antiqua, Pias-Roma (X): 125-129.

D'Amico F.C., 1816, Osservazioni pratiche intorno alla pesca, corso e cammino de' tonni. Società Tipografica, Messina: 1-164.

Di Natale A., 2012, Literature on the eastern Atlantic and Mediterranean Tuna Trap Fisheries. ICCAT GBYP Symposium on Trap Fisheries for Bluefin Tuna. Collect. Vol. Sci. Pap. ICCAT, 67: 175-220.

Di Natale A., 2013, The ancient distribution of tuna traps: how coins can improve our knowledge. Collect. Vol. Sci. Pap., ICCAT, 70 (6) :2828-2844.

Di Natale A., 2015, ICCAT Atlantic-wide programme for Bluefin Tuna (GBYP). Activity Report for Phase 4 (2013-2014). Collect. Vol. Sci. Pap. ICCAT, 71(3): 1174-1214.

Di Natale A., Idrissi M., 2012, Factors to be taken into account for a correct reading of the tuna trap catch series. ICCAT GBYP Symposium on Trap Fisheries for Bluefin Tuna. Collect. Vol. Sci. Pap. ICCAT, 67: 242-261.

Di Natale, A., Tensek, S. and Pagá García, A., (2017). *In press*. SCRS/2016/193. ICCAT Atlantic-Wide Research Programme For Bluefin Tuna (GBYP) Activity Report for the Last Part of Phase 5 and the First Part of Phase 6 (2015-2016). 78p.

Gamberini E., 1918, Monografia marittima. La pesca del tonno. Ed. Principato, Messina : 1-375.

Gangemi M., 2011, La pesca nel Mezzogiorno tra Otto e Novecento: Tonnare, Pesci, Spugne e Coralli. Saggi di Storia Economica, 23, Dipartimento di Scienze Economiche e Metodi Matematici, Università di Bari, Cacucci Editore, Bari: 1-214.

Idrissi, 2013, La Sicilia ed il Mediterraneo nel Libro di Ruggero. Trad. Michele Amari and Celestino Schiapparelli. Mediterraneo Storia, Accade in Sicilia Libri, Milano: 1-173.

La Mantia V., 1901, Le Tonnare in Sicilia. Stab. Tip. A Giannitrapani, Palermo: 1-55.

Parona C., 1915, Per la storia della pesca in Italia. Tonnare e miniere in Sardegna. Atti Soc. Ligustica Sci. Nat. Geogr., 26: 1-38.

Pavesi P., 1889, L'industria del Tonno. Relazione alla Commissione Reale per le Tonnare. Min. Agric. Indust. Comm., Roma, Tip. Eredi Botta: 1-254.

Tricamo M., 2015, Tonnare, tonni, mattanze, barche e maestri d'ascia tra Sicilia nord-orientale e Calabria. Lombardo Edizioni, Milazzo: 1-429.

Table 1a. Tuna traps in Sicily over the centuries (first part).

ID	Trap name	Latitude	Longitude	Classic Era	1100	Medium Age	1500	1600	1700	1800	1900	2000
1	Abiglaturi (Vigliatore)	38,139619	15,126481									
2	Acireale	37,610000	15,180000									
3	Acqua dei Corsari	38,110000	13,420000									
4	Agnone (Gnuni)	37,324649	15,125670									
5	Akrags (Agrigento o Girgenti)	37,284118	13,520876									
6	Arenella	38,152000	13,376000									
7	Asinelli	38,063800	12,569600									
8	Avola	36,907542	15,156826									
9	Bafuto	36,802300	15,099300									
10	Battilimanu	38,001056	13,838451									
11	Blanco	37,995246	13,815300									
12	Bonacia	36,644000	15,080000									
13	Bonagia	38,067400	12,594800									
14	Brucoli (Bruca)	37,284000	15,188300									
15	Cala Pozzillo	38,185000	13,135000									
16	Calasicca (Galiasicca)	37,979993	13,813851									
17	Calderà	38,170000	15,180000									
18	Camarana	36,815550	14,456683									
19	Cannizzo	37,808321	12,433269									
20	Capicello	38,151339	13,382475									
21	Capo Bianco	37,493915	13,123578									
22	Capo Boeo	37,890373	12,430628									
23	Capo D'Orlando	38,170000	14,740000									
24	Capo Feto	37,661000	12,540000									
25	Capo Passero grande	36,676415	15,145691									
26	Capo Passero piccolo	36,664112	15,136024									
27	Caponero	36,920469	15,173627									
28	Carini	38,170000	13,180000									
29	Caronia	38,040000	14,450000									
30	Castellammare del Golfo	38,032926	12,888611									
31	Cefalù	38,041000	14,020000									
32	Cinisi	38,171885	13,076389									
33	Colobra	37,993789	13,686705									
34	Cruchi	38,016486	14,332636									
35	Curto	38,111650	12,680454									
36	Dei Gigli	37,701000	12,471000									
37	del Pepe (Capo Bianco)	37,388800	13,274400									
38	Della Cattiva	37,481996	13,178101									
39	Detta	38,174647	13,082142									
40	Falconara	37,107576	14,053459									
41	Fano	36,776296	15,097655									
42	Favignana	37,933333	12,333333									
43	Finale	38,021111	14,164444									
44	Fiume di Noto	36,860000	15,122000									
45	Fontane Bianche	36,959611	15,213304									
46	Formica	37,988000	12,425000									
47	Galia Sicca	37,994833	13,670766									
48	Gela	37,053495	14,215864									
49	Girgenti	37,287011	13,495064									
50	Golfo	38,244294	15,238200									
51	Grotte (Torremuzza)	38,015042	14,323558									
52	Isola delle Femmine (Capace o Fimi)	38,203000	13,241000									
53	Isoletta	37,124840	15,231356									
54	Kalura	38,034251	14,041178									
55	Katane (Catania)	37,515553	15,112492									
56	La Lupa	37,975914	13,743671									
57	La Gabbia	38,209984	15,271835									
58	La Punta	38,165892	14,748502									
59	Lampedusa	35,498921	12,607342									
60	Lentini (Leontini)	37,320000	15,110000									
61	Levanzo (Punta Altarella)	37,993244	12,351422									
62	Limpiadum (Licata)	37,096838	13,949082									
63	Macauda	37,483242	13,177600									
64	Magazzinazzi	38,016667	12,933333									
65	Magnisi	37,155894	15,237882									
66	Malpetitto	38,223511	15,357456									
67	Margió	38,018652	14,335932									
68	Marsala	37,801729	12,419831									
69	Marzamemi	36,740000	15,116000									
70	Mazara	37,570780	12,649891									
71	Mazzarelli	36,716485	14,734625									
72	Melilli	37,191804	15,187783									
73	Milazzo (Grande del Porto)	38,216866	15,245900									
74	Mondello	38,190667	13,336167									
75	Monte Rossú	37,290938	13,453969									

Table 1b. Tuna traps in Sicily over the centuries (second part).

ID	Trap name	Latitude	Longitude	Classic Era	1100	Medium Age	1500	1600	1700	1800	1900	2000
76	Monzella	37,780782	12,466893									
77	Nubia	37,979176	12,491123									
78	Ognina	36,979914	15,265801									
79	Oliveri	38,145800	15,158400									
80	Palma di Montechiaro	37,171100	13,718700									
81	Patti	38,148463	14,974413									
82	Pepe (Capobianco o Baronia)	38,244947	15,237639									
83	Poggio Grosso	37,311162	15,104654									
84	Polluci	37,581074	12,831018									
85	Portopalo	36,680300	15,136500									
86	Pozzallo	36,727200	14,848700									
87	Presuliana (Resuliana)	38,033174	13,947300									
88	Puntanera	38,038333	12,870833									
89	Puntasecca	37,314677	13,416061									
90	Raisgelbi (o Rais Gerbi)	37,027171	14,143328									
91	Reitano	38,013414	14,325410									
92	Resulana	38,035335	13,979990									
93	Roccabianca	38,160905	14,995772									
94	Rotolo	38,191922	13,359726									
95	S. Antonino di Milazzo	38,239000	15,241000									
96	S. Calogero	37,369035	15,092059									
97	S. Elia	38,096000	13,540000									
98	S. Erasmo	38,112689	13,381167									
99	S. Giorgio	38,096000	13,540000									
100	S. Giorgio dei Genovesi (Palermo)	38,143789	13,374192									
101	S. Giuseppe	36,740400	15,127100									
102	S. Maria del Piano	38,167485	14,744620									
103	S. Nicola l'Arena	38,024821	13,614151									
104	S. Nicola Malastri	37,196870	13,653727									
105	S. Nicolò di Benidormi	38,016000	13,616000									
106	S. Panagia	37,111400	15,252000									
107	S. Tito	38,091324	12,652658									
108	S. Vito lo Capo	38,189000	12,734000									
109	S. Vittore	38,044076	12,439420									
110	Salicà	38,120000	15,120000									
111	Salsa	37,430278	13,235342									
112	San Cusumano	38,054700	12,547000									
113	San Giuliano Palazzo	38,027400	12,526600									
114	San Leonardo	37,996334	13,688343									
115	San Rosalia	38,139582	13,052612									
116	San Saba (Castanía)	38,284662	15,493639									
117	San Teodoro	37,917869	12,425552									
118	Santa Lucia	38,218333	15,273333									
119	Sazzarello	37,234952	15,232382									
120	Scala Greca	37,102394	15,299158									
121	Sciacca - Lo Tono	37,505000	13,072700									
122	Scibiliana	37,729363	12,467454									
123	Scopello	38,076800	12,819000									
124	Secco	38,167000	12,770000									
125	Sferracavallo	38,203835	13,267072									
126	Sibiliana	37,720356	12,468710									
127	Sicciara	38,045225	12,981519									
128	Siculiana	37,337300	13,386800									
129	Siracusa	37,075988	15,296256									
130	Solanto	38,074000	13,543000									
131	Sta in Pace	36,807196	15,106412									
132	Termini	37,991259	13,712600									
133	Terrauzza	37,014800	15,304000									
134	Tipa	38,328860	12,526973									
135	Tonnarazza (Palermo)	38,105371	13,999714									
136	Tonnarazza (Venetico)	38,226022	15,371354									
137	Tono (Pedale)	38,107402	12,692423									
138	Tono di Milazzo	38,223800	15,221100									
139	Torre Caldura (Kalura)	38,036000	14,039000									
140	Torre Cofano	38,128700	12,715500									
141	Torre della Tonnara Dell'Orsa (Ursa)	38,183333	13,116667									
142	Torre di Gaffe (Delli Gaffi)	37,136241	13,830161									
143	Torre Granitola	37,573531	12,645522									
144	Torre Molinazzo	38,160982	13,079671									
145	Trabia	37,997000	13,655000									
146	Tre Fontane	37,560490	12,669120									
147	Tusa (Cruchi)	38,013000	14,255000									
148	Uzzo (o Guzzo o Guazo)	38,120252	12,788655									
149	Vaccarella (del Silipo o Cattafi)	38,221667	15,240833									
150	Vendicari (Torre Vendicari)	36,802164	15,106412									
151	Verdura	37,496641	13,116079									
152	Vergine Maria	38,166266	13,373507									
153	Zappardini (Capo Zappardini)	38,178000	14,893000									

Figure 1. Distribution of tuna traps (salting plants and coins with tuna) in Sicily in the classic ages (V b.C.-V a.C.)

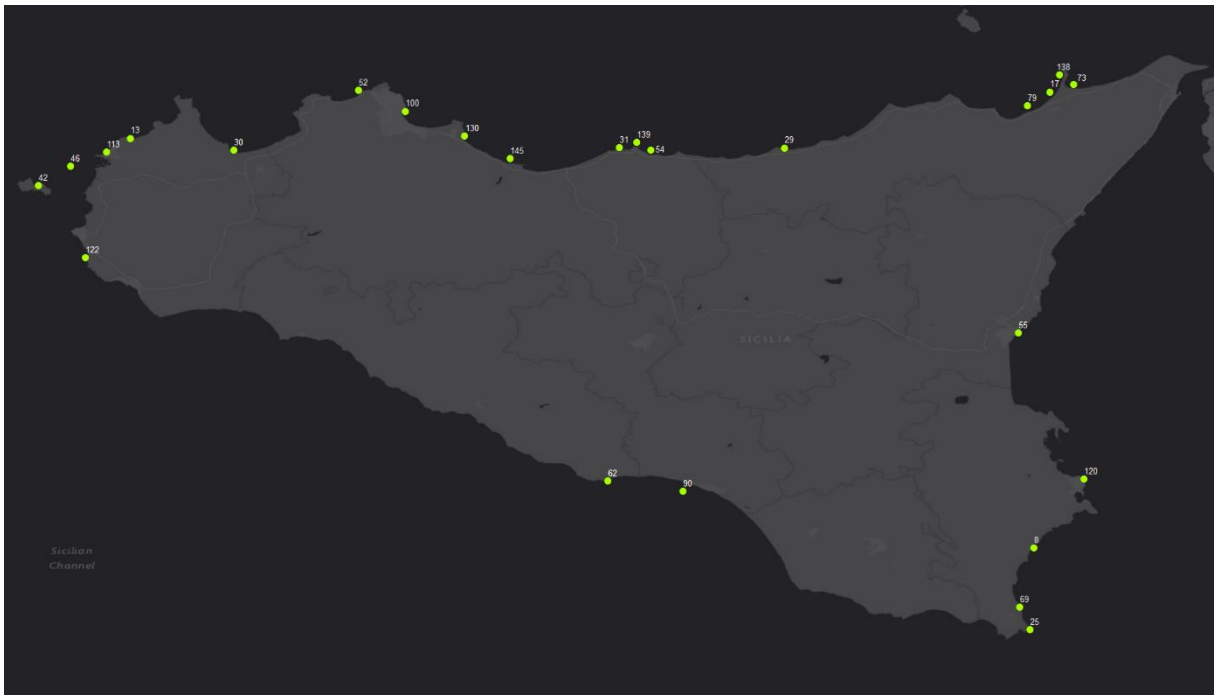

Figure 2. Distribution of tuna traps in Sicily in the XII century.

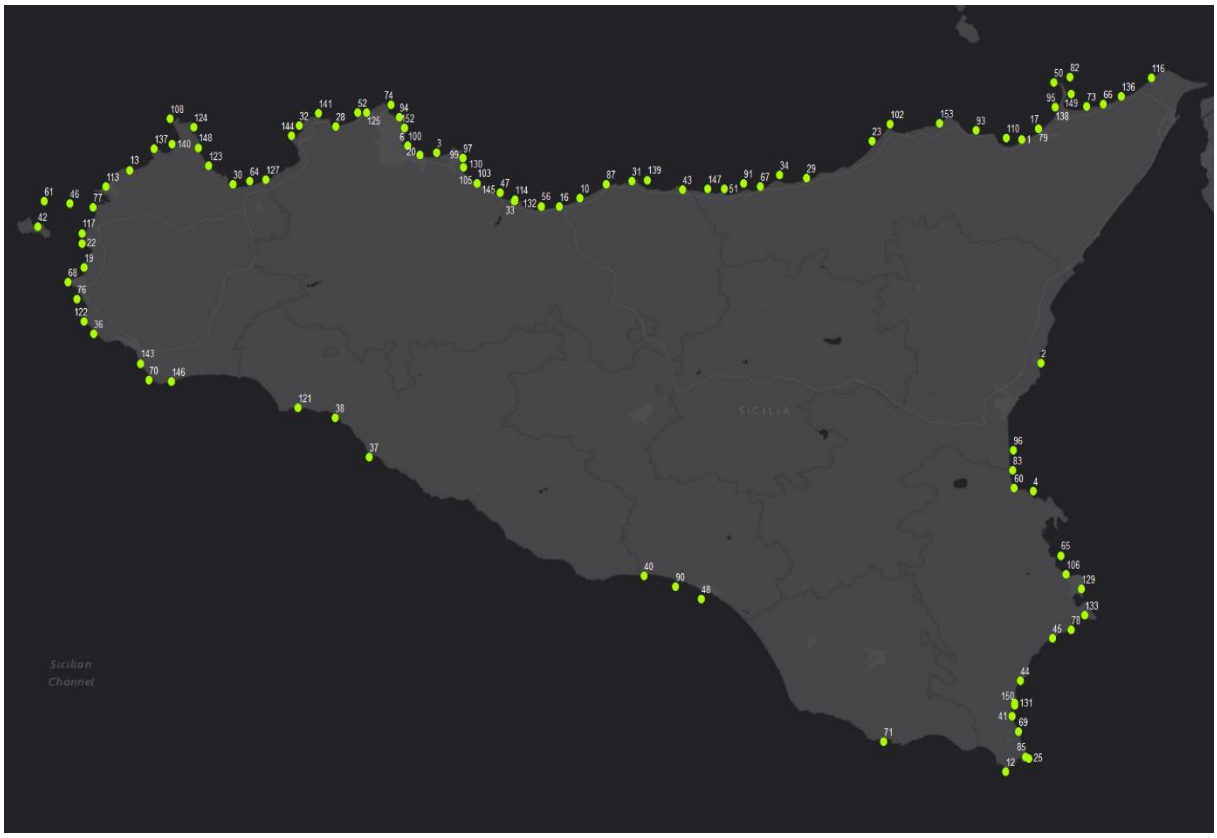

Figure 3. Distribution of tuna traps in Sicily in the late Middle Ages (XIII to XV century).

Figure 4. Distribution of tuna traps in Sicily in the XVI century.

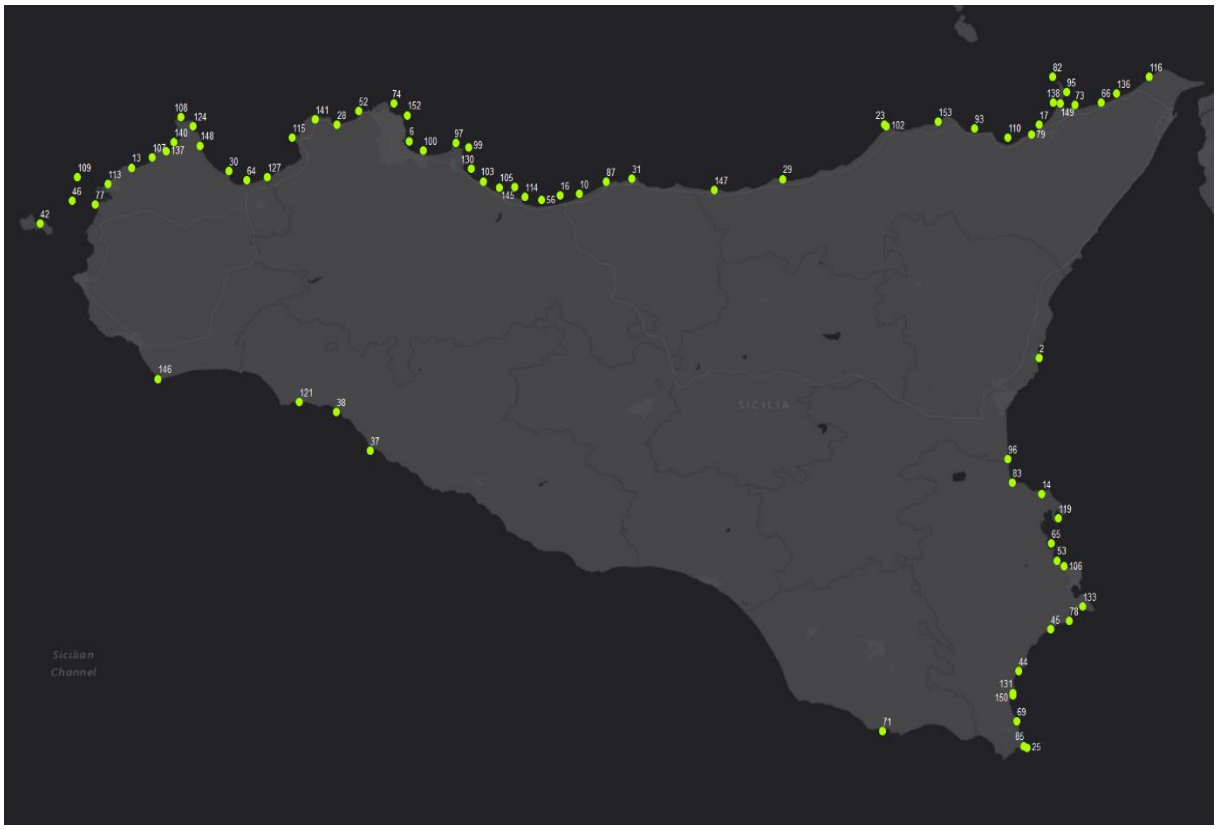

Figure 5. Distribution of tuna traps in Sicily in the XVII century.

Figure 6. Distribution of tuna traps in Sicily in the XVIII century.

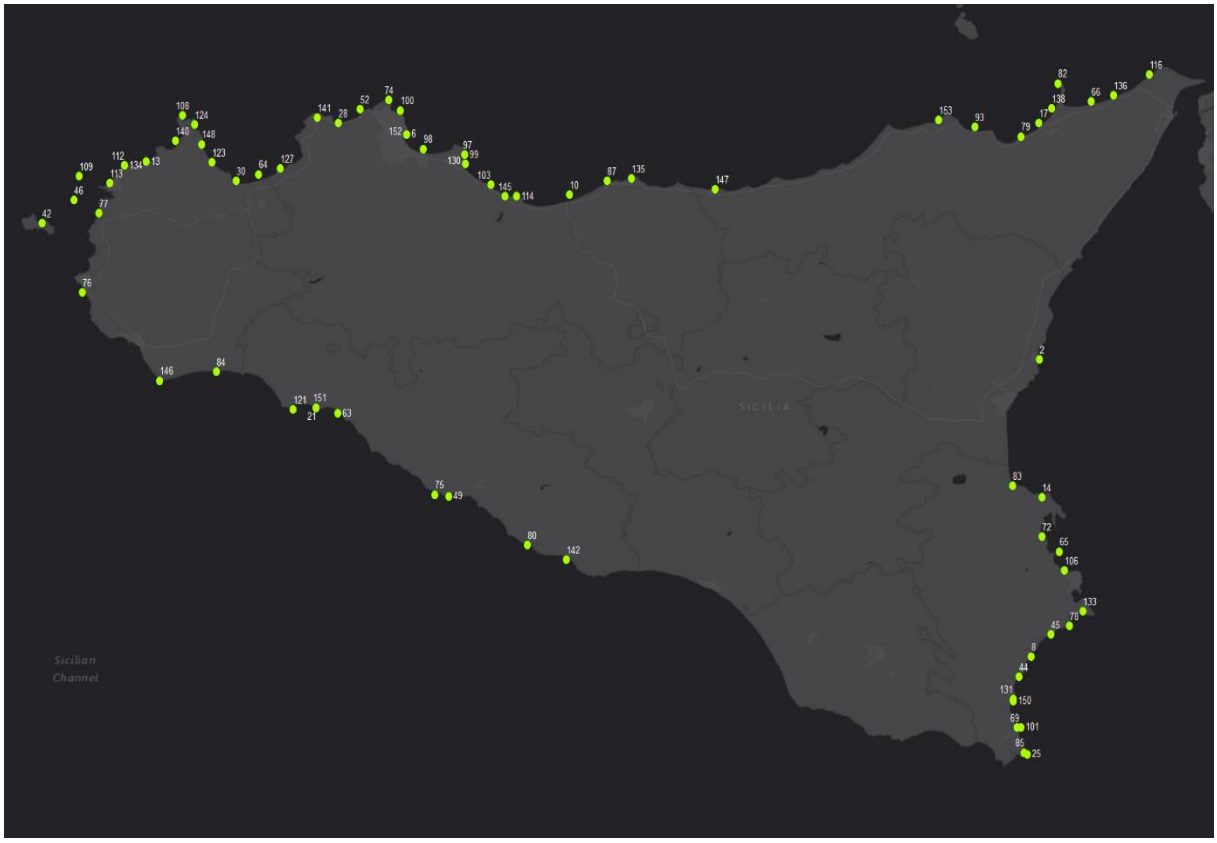

Figure 7. Distribution of tuna traps in Sicily in the XIX century.

Figure 8. Distribution of tuna traps in Sicily in the XX century.

Figure 9. Distribution of tuna traps in Sicily in the XXI century.

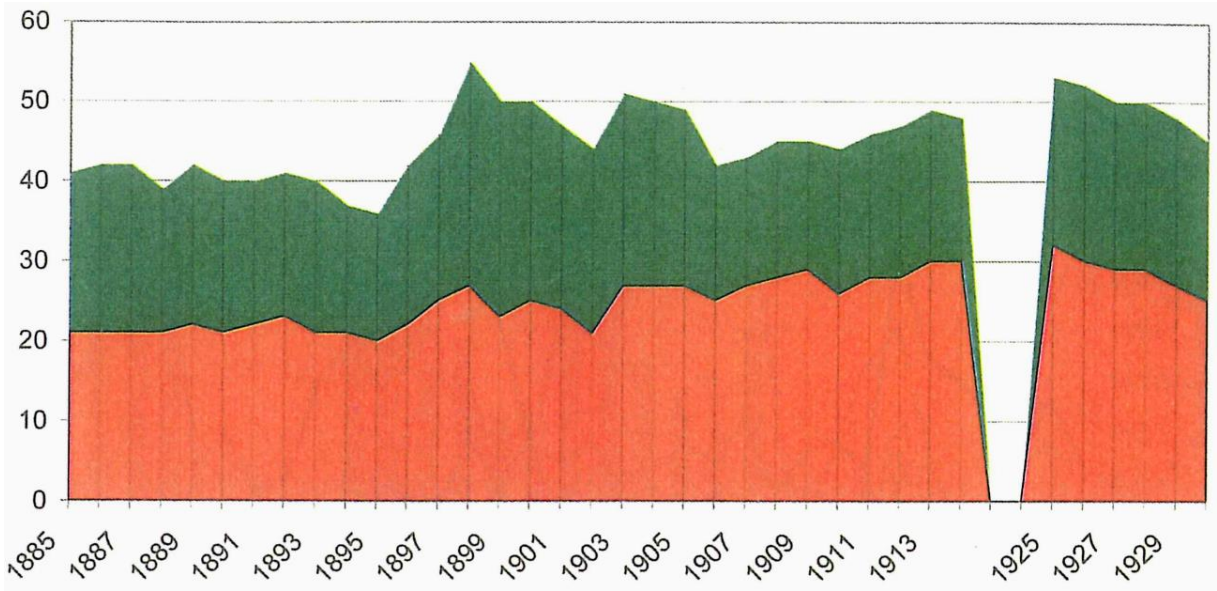

Figure 10. Graph showing the different number of active tuna traps by year in Sicily during the period 1885-1930, compared to the total active traps in Italy (from Gangemi, 2011). The total cumulative Italian traps are in green, while the Sicilian traps are in red.

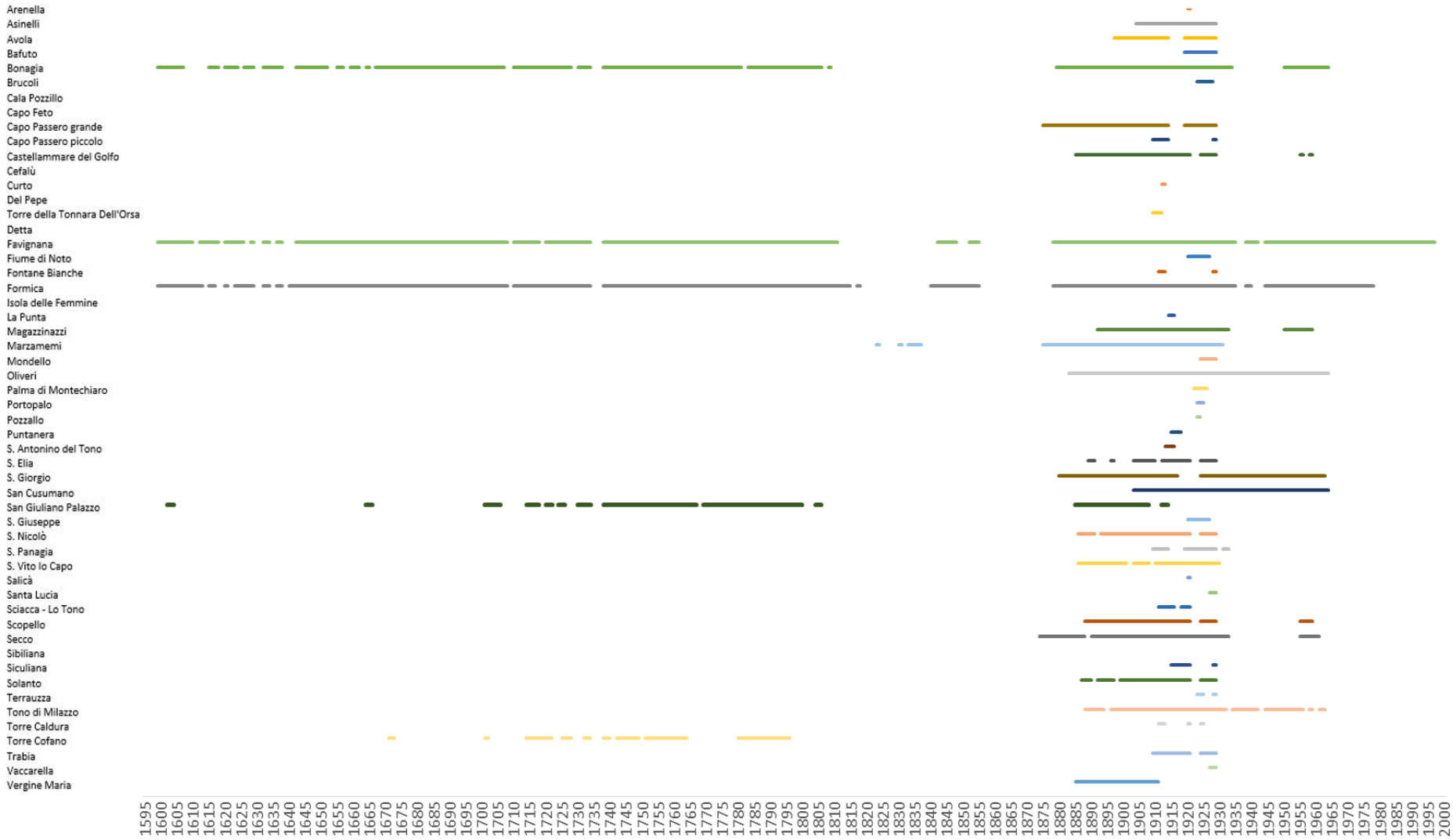

Figure 11. Trap data series currently available in the ICCAT Bluefin tuna data base, as recovered by GBYB.

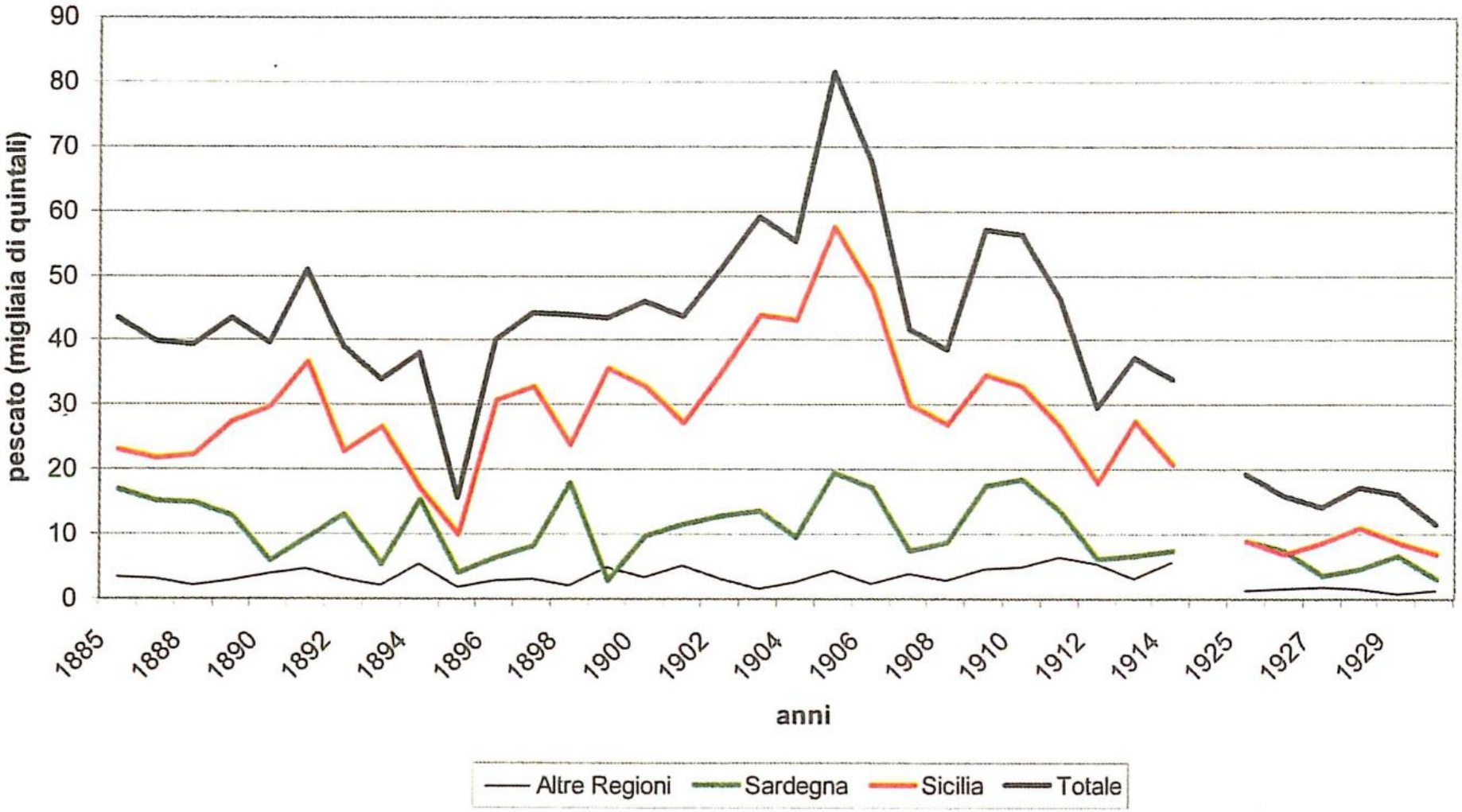

Figure 12. General overview of the annual Bluefin tuna official production of tuna traps in Italy for the period 1885-1930 (from Gangemi, 2011). It is very clear that the Sicilian traps provided the majority of the catches at that time. Catches are shown with a scale of 100 tons, therefore the peak was in 1906, when the total Italian Bluefin tuna production obtained by tuna traps reached a total of over 8,000 tons.

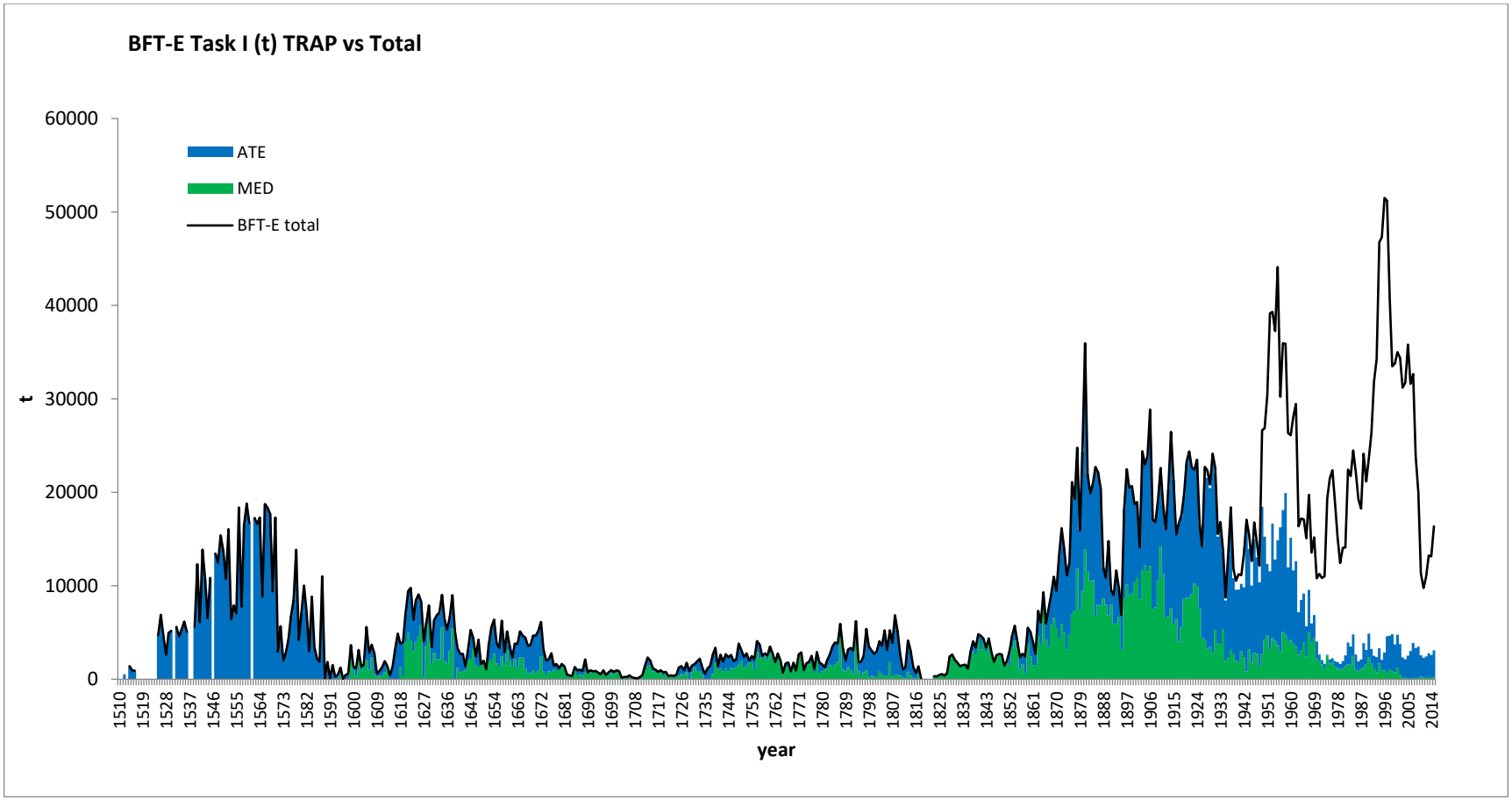

Figure 13. General overview of the Bluefin tuna catches recorded in the ICCAT BFT Task-1 data base. Trap catches were the totality until the first part of the XX century. The comparison is not straightforward, because the data of ancient traps were only partly recovered and therefore the total BFT-E catches should be much higher for the historical periods (possibly between two and three times higher), but the level is still unknown.