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Length-Weight Relationships of 52 Species from the South of Sicily (Central Mediterranean Sea)

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Abstract: The Length-Weight relationships (LWRs) of 52 species (14 never reported before) of fishes, crustaceans and cephalopods living on the shelf and upper slope off Southern Sicily are provided. Data were collected in the framework of the International bottom trawl survey in the Mediterranean (MEDITS) in the South of Sicily (Central Mediterranean), covering a time frame ranging from 2012 to 2019. Linear regressions were significant for all species ($p < 0.05$) with R^2 values ranging from 0.86 to 0.99. The intercept (a) of LWRs ranged from 0.0003 to 0.4677, while the slope (b) ranged from 2.1281 to 3.306. The Welch *t*-test, used to evaluate differences between the obtained LWRs with those reported in the literature, revealed that most of the LWRs (about 55%) reported in this study are in disagreement with those obtained previously by other authors from the Strait of Sicily. It is expected that the results obtained from this study will contribute to filling the knowledge gap of fish populations in this area and also assist fisheries scientists in future stock assessment studies.

Keywords: LWR; bony fishes; cartilaginous fishes; cephalopods; crustaceans

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1. Introduction

A historical review of the Length-Weight relationship shows that the relationship between length (L) and weight (W) of fish was formally expressed by Keys [1] in the equation: $W = aL^b$. Many authors published on the cube law of the weight–length relationship, e.g., [2], and several interpretations of the exponent b were presented. Ricker, in the year 1958, used the term "isometric growth", for the value of b = 3, and Tesch, in the year 1968, used the term "allometric growth" for values other than b = 3 [3,4]. The importance of determining LWRs in fish was emphasized by many studies [2,5,6]. Length and weight relationships provide important information for stock assessment as well as population dynamics [7,8]. Indeed, they provide information about the growth pattern, general health, habitat conditions, life history, fish condition as well as morphological characteristics of the fish [2,4,9–11]. In addition, LWRs information is necessary to estimate the biomass from length-frequency data [12–14] and is useful for between-region comparisons of life histories of certain species [15,16]. Despite their importance, LWRs are frequently incomplete and limited to the most common or commercial species. In the Eastern and Western Mediterranean basins, there are more studies focused on LWRs of fishes [17–23] than in the Central Mediterranean [24,25]. Considering the paucity of data about LWRs in the published literature (many LWRs are reported in the grey literature), at least in the Strait of Sicily [11,26–28], the present note aims to fill this knowledge gap by reporting the first references of LWRs of 14 species and updating the LWRs of the most studied species.

2. Materials and Methods

The study area was located off the south-western coast of Sicily within the Geographical Sub Area 16 (GSA16, according to the General Fisheries Commission for the Mediterranean—GFCM—classification; GFCM, 2007), namely the northern sector of the Strait of Sicily (Figure 1). This area covers about 31,000 km^2, and it is characterized by the presence of two wide and shallow banks (<100 m), one in the west (Adventure Bank) and one in the east (Malta Bank), and by a wide portion of water generally with depth higher than 200 m [29,30].

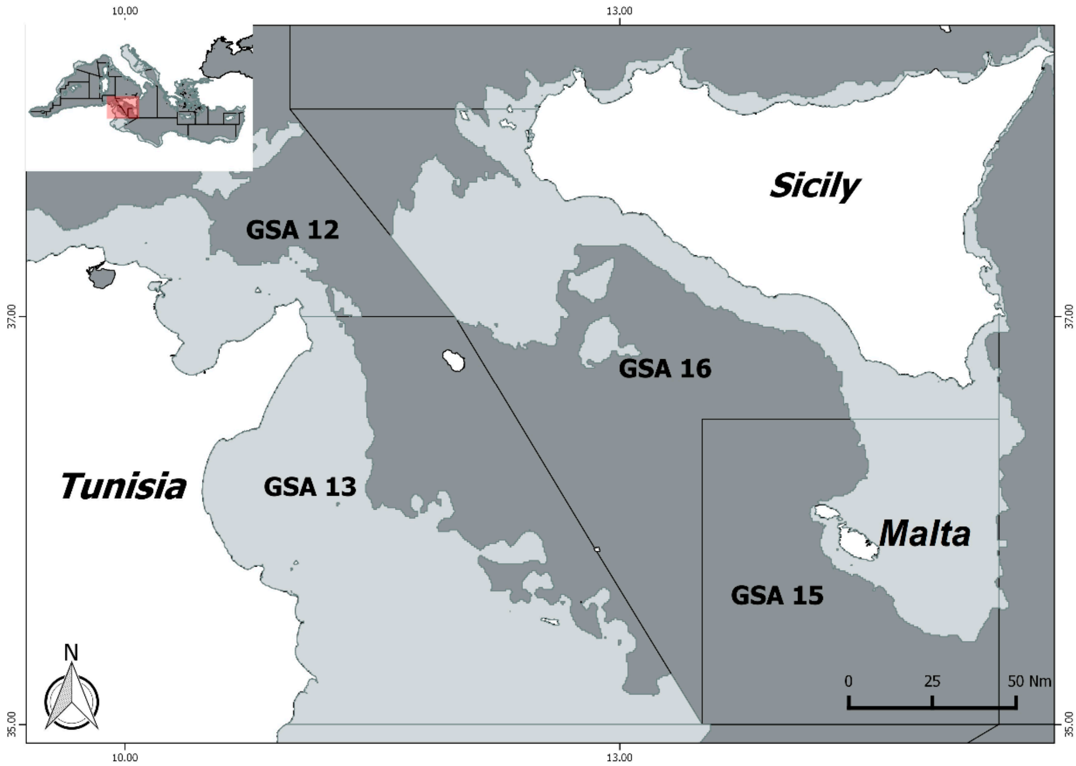

Figure 1. The sampling area covered by the MEDITS survey in the Strait of Sicily.

Samples were collected during the international bottom trawl survey in the Mediterranean (MEDITS) in a time frame ranging from 2012 to 2019. The MEDITS survey was carried out during the summer and fall seasons using a GOC 73 trawl net characterized by a vertical opening ranging between 2.4 and 2.9 m and a 20 mm stretched mesh-size at the cod end [31,32].

All samples were frozen on board and subsequently processed in the laboratory for biometric measurements. All species were measured and weighed according to MEDITS protocol [33–35]. In particular, the cephalopods were measured as mantle length (ML) at the lower 0.5 cm and weighted to the nearest 0.1 gr, crustaceans as carapace length (CL) at the lower 1 mm while the weight was recorded to the nearest 0.01 gr and fishes as total length (TL) at the lower 0.5 and weight to the nearest 1 gr.

The relationship between length and weight was calculated using the following classical Equation (1):

$$W = aL^b \quad (1)$$

Being TW total weight (g), L is TL (cm) for fish, ML for cephalopods (cm), CL for crustaceans (mm), a and b are the equation parameters calculated applying a linear regression model using the logarithmic form of Equation (2) as:

$$\log TW = \log a + b \log L \quad (2)$$

All species with less than 10 specimens were excluded from the analysis. Furthermore, according to the recommendations of Froese et al. [14] and Evagelopoulos et al. [36], the outliers (data points whose response values did not follow the general trend of the remaining data) were removed from the initial database. In addition, the analysis of covariance (ANCOVA) was performed to determine eventual significant differences between the sexes. The LWRs were shown by sex only when significant differences emerged by ANCOVA analysis; otherwise, they were provided as combined. The growth types (allometric or isometric) were tested using the *t*-test that investigates whether the slope b was significantly different from the theoretical value 3 (i.e., isometric growth), with a confidence level of 95% [37]. For both a and b, the confidence interval was provided. In addition, the differences between the prediction LWRs values of the present study with those reported in the literature in the Strait of Sicily were assessed through Welch *t*-test. All analyses were performed using R 4.0.3 [38].

3. Results

A total of 52 species belonging to 37 families were analyzed in this study. The best-represented family was Sparidae with six species, while the most abundant species was *Parapenaeus longirostris* Lucas, 1846 with about 47,128 specimens, followed by *Merluccius merluccius* (Linnaeus, 1758) and *Illex coindetii* (Vérany, 1837) with 16,933 and 8754 specimens, respectively. The statistical descriptions of parameters obtained for each species are shown in Table 1, whereas a comparison with other studies from the Strait of Sicily and the outcomes of the *t*-test is provided in Table S1 [24,26,27,39–59].

Table 1. Length-Weight relationships of 52 species from the South of Sicily. The species in bold type are those firstly reported in the Strait of Sicily. Length is reported in mm for crustaceans and in cm for cephalopods, bony and cartilaginous fishes. Weight is reported at 0.1 grams' accuracies for crustaceans and cephalopods and at grams for bony and cartilaginous fishes. N: sample size; sd: standard deviation; a: the intercept of the regression curve with the confidence interval; b: the regression slope with the confidence interval, T: student *t*-test; P: *p*-value of *t*-test; R^2: the coefficient of determination; T.G: type of growth: A^+, positive allometric growth; A^-, negative allometric growth; I, Isometric growth.

Specie	SEX	N	Length (Min–Max)	Weight (0.1 g, Min–Max)	a	2.50%	97.50%	b	2.50%	97.50%	T.G.	T	P	R^2
Crustaceans														
Aristaemorpha foliacea	F	4290	15–68	1.6–85.2	0.0017	0.0017	0.0018	2.5663	2.5587	2.574	A^-	−111.05	s	0.99
	M	3226	19–52	3.2–45.9	0.0013	0.0012	0.0014	2.671	2.65	2.692	A^-	−30.7	s	0.95
Aristeus antennatus	F	710	18–59	3.7–59.2	0.0056	0.0052	0.0062	2.2591	2.2357	2.2826	A^-	−62.14	s	0.98
	M	85	19–35	3.7–16.9	0.0083	0.0054	0.0128	2.1281	1.9945	2.2617	A^-	−12.98	s	0.92
Nephrops norvegicus	F	2313	17–49	3.3–93.9	0.0006	0.0006	0.0006	3.0578	3.0411	3.0744	A^+	6.81	s	0.98
	M	3271	18–68	3.8–224.0	0.0005	0.0005	0.0005	3.115	3.1034	3.1267	A^+	19.43	s	0.99
Parapenaeus longirostris	F	25,674	ago–43	0.6–28.4	0.0035	0.0035	0.0036	2.4325	2.4272	2.4378	A^-	−208.3	s	0.97
	M	21,454	ago–35	0.6–17.9	0.0052	0.0051	0.0053	2.2822	2.2739	2.2905	A^-	−169.63	s	0.93
Squilla mantis	C	127	78–182	5.5–66.6	0.0017	0.0115	0.0262	2.8296	2.6705	2.9886	A^-	−2.12	s	0.91
Cephalopods														
Eledone cirrhosa	C	307	3.5–15.0	6.8–674.5	0.3141	0.2596	0.3801	2.859	2.7718	2.9464	A^-	−3.17	s	0.93
Eledone moschata	C	659	4.0–13.0	20.0–516.9	0.4677	0.3952	0.5535	2.6492	2.5672	2.7311	A^-	−8.4	s	0.86
Illex coindettii	F	4652	3.5–21.5	2.9–272.0	0.0512	0.0503	0.0537	2.7595	2.745	2.7733	A^-	−33.38	s	0.97
	M	4102	4.0–19.0	2.9–228.2	0.0286	0.0273	0.03	3.0797	3.0581	3.1014	A^+	7.2	s	0.95
Loligo vulgaris	C	2625	4.0–45.0	2.6–1600.5	0.107	0.1029	0.1113	2.5527	2.5342	2.5711	A^-	−47.6	s	0.97
Octopus vulgaris	C	398	4.0–19.5	31.9–3250.0	0.3996	0.3376	0.4729	2.9715	2.8909	3.0501	I	−0.69	ns	0.93
Sepia officinalis	F	150	4.0–19.0	12.3–750.0	0.3048	0.2742	0.3388	2.6484	2.5986	2.6983	A^-	−13.94	s	0.99
	M	134	5.0–17.5	18.5–571.9	0.2474	0.214	0.2859	2.7219	2.6534	2.7904	A^-	−8.03	s	0.98

Table 1. *Cont.*

Specie	SEX	N	Length (Min–Max)	Weight (0.1 g, Min–Max)	a	2.50%	97.50%	b	2.50%	97.50%	T.G.	T	P	R^2
Todarodes sagittatus	**C**	**199**	**8.5–38.5**	**23.6–2048.5**	**0.0174**	**0.0133**	**0.0226**	**3.1427**	**3.0584**	**3.227**	**A^+**	**3.35**	**s**	**0.98**
							Bony fishes							
Boops boops	C	312	10.0–25.5	9–169	0.0064	0.0052	0.0078	3.1709	3.0988	3.2429	A^+	4.67	s	0.96
Chelidonichthys cuculus	**F**	**2412**	**10.0–31.5**	**10–337**	**0.0078**	**0.0073**	**0.0083**	**3.0937**	**3.0714**	**3.1161**	**A^+**	**8.2178**	**s**	**0.97**
	M	**1971**	**10.0–24.5**	**8–164**	**0.0097**	**0.009**	**0.0105**	**3.0151**	**2.9871**	**3.0432**	**I**	**1.0591**	**ns**	**0.96**
Chelidonichthys lastoviza	C	682	5.5–21.5	2–117	0.0139	0.0122	0.0158	2.9326	2.8866	2.9787	A^-	−2.87	s	0.97
Chelidonichthys lucerna	C	450	5.0–71.0	2–45	0.0121	0.0111	0.0132	2.9219	2.8899	2.9539	A^-	−4.79	s	0.99
Citharus linguatula	**F**	**1250**	**9.5–24.5**	**7–132**	**0.0064**	**0.0059**	**0.007**	**3.0859**	**3.0525**	**3.1192**	**A^+**	**5.0573**	**s**	**0.96**
	M	**907**	**9.0–26.0**	**6–170**	**0.0075**	**0.0067**	**0.0083**	**3.0226**	**2.9798**	**3.0654**	**I**	**1.0367**	**ns**	**0.96**
Diplodus annularis	C	86	9.0–18.0	14–102	0.0384	0.0258	0.0571	2.728	2.5804	2.8747	A^-	−3.7417	s	0.97
Engraulis encrasicolus	C	2313	8.5–16.5	4–32	0.0036	0.0032	0.0041	3.2233	3.1728	3.2738	A^+	8.67	s	0.87
Eutrigla gurnardus	**C**	**232**	**6.0–24.5**	**2–125**	**0.0099**	**0.008**	**0.0124**	**2.9741**	**2.8914**	**3.0568**	**I**	**−0.616**	**ns**	**0.97**
Helicolenus dactylopterus	C	5069	2.0–34.0	2–664	0.0195	0.0189	0.0201	2.9479	2.9369	2.9589	A^-	−9.32	s	0.99
Lepidopus caudatus	**C**	**2587**	**17.0–185.0**	**3–86**	**0.0003**	**0.0003**	**0.0004**	**3.1417**	**3.1268**	**3.1567**	**A^+**	**18.6381**	**s**	**0.99**
Lepidorhombus boscii	C	632	6.5–38.5	2–470	0.0058	0.0053	0.0063	3.1214	3.0946	3.1481	A^+	8.9042	s	0.98
Lophius budegassa	F	232	10.5–78.0	26–4935	0.0191	0.0165	0.0222	2.9097	2.8666	2.9529	A^-	−4.1	s	0.99
	M	366	11.0–60.5	20–2882	0.0241	0.0202	0.0288	2.8249	2.7719	2.8778	A^-	−6.5	s	0.97
Lophius piscatorius	C	95	13.0–113.0	32–19420	0.0219	0.0187	0.0257	2.8909	2.8477	2.9343	A^-	−5	s	0.99
Merluccius merluccius	C	16933	10.0–80.5	5–4086	0.0051	0.005	0.0052	3.1107	3.1057	3.1157	A^+	43.39	s	0.99
Micromesistius poutassou	C	175	10.0–32.5	8–272	0.0058	0.0047	0.0071	3.0934	3.0224	3.1645	A^+	2.59	s	0.98
Mullus barbatus	F	3533	6.0–27.5	2–275	0.0127	0.0122	0.0133	2.9656	2.9494	2.9819	A^-	−4.13	s	0.97
	M	3661	8.5–26.0	7–232	0.0211	0.0199	0.0022	2.7612	2.7378	2.7844	A^-	−20.17	s	0.94
Mullus surmuletus	C	1528	10.0–30.0	12–375	0.0133	0.0123	0.0143	2.971	2.9438	2.9982	A^-	−2.09	s	0.97
Pagellus acarne	C	1250	6.0–28.5	2–359	0.0097	0.0089	0.0107	3.1093	3.0739	3.1446	A^+	6.0658	0	0.98
Pagellus bogaraveo	C	788	6.5–33.0	4–495	0.0103	0.0089	0.0119	3.0573	3.1617	3.185	A^+	4.13	0	0.98
Pagellus erythrinus	C	847	9.0–44.0	10–1250	0.0193	0.0178	0.0209	2.8794	2.8507	2.9082	A^-	−8.22	s	0.98
Pagrus pagrus	**C**	**22**	**12.0–29.0**	**29–345**	**0.0262**	**0.0154**	**0.0045**	**2.8329**	**2.6355**	**3.0304**	**I**	**−1.7**	**ns**	**0.98**
Phycis blennoides	F	1889	9.5–52.5	5–1750	0.0048	0.0046	0.005	3.1335	3.1209	3.1461	A^+	20.7828	0	0.99
	M	1489	10.5–44.5	7–771	0.0044	0.0042	0.0046	3.1634	3.1454	3.1814	A^+	17.8251	0	0.99
Sardina pilchardus	C	2783	8.5–18.0	5–49	0.0032	0.0032	0.0041	3.306	3.2575	3.3544	A^+	12.38	s	0.87
Sardinella aurita	C	136	9.5–17.0	7–35	0.0065	0.0043	0.0096	3.0251	2.8686	3.1815	I	0.31	ns	0.92
Scomber colias	**C**	**147**	**6.5–32.0**	**2–293**	**0.006**	**0.0042**	**0.0085**	**3.1017**	**2.973**	**3.2304**	**I**	**1.57**	**ns**	**0.97**
Spicara flexuosa	**F**	**3606**	**9.0–20.0**	**8–100**	**0.013**	**0.0122**	**0.0138**	**2.9537**	**2.9292**	**2.9783**	**A^-**	**−3.6947**	**s**	**0.94**
	M	1178	10.0–21.0	9–175	0.0106	0.0097	0.0116	3.0357	3.0014	3.0701	A^+	2.042	s	0.96

Table 1. *Cont.*

Specie	SEX	N	Length (Min–Max)	Weight (0.1 g, Min–Max)	a	2.50%	97.50%	b	2.50%	97.50%	T.G.	T	P	R^2
Spicara smaris	C	170	5.5–19.0	1–70	0.0159	0.007	0.0361	2.7723	2.4623	3.0824	I	−1.49	ns	0.91
Trachurus mediterraneus	F	649	10.5–26.5	10–166	0.0162	0.0141	0.0185	2.7467	2.6968	2.7965	A⁻	−9.98	s	0.95
	M	464	11.0–28.0	10–185	0.0129	0.0108	0.0153	2.8333	2.769	2.8976	A⁻	−5.09	s	0.94
Trachurus trachurus	C	5175	8.5–45.0	5–688	0.0076	0.0074	0.0079	3.0382	3.0253	3.0512	A⁺	5.79	s	0.98
Trisopterus capelanus	**F**	**95**	**10.0–20.5**	**10–100**	**0.0084**	**0.0054**	**0.0129**	**3.0961**	**2.9291**	**3.2631**	**I**	**1.1429**	**ns**	**0.93**
	M	**64**	**10.5–18.0**	**9–61**	**0.0108**	**0.0052**	**0.0222**	**3.0114**	**2.73**	**3.2928**	**I**	**0.0809**	**ns**	**0.88**
Zeus faber	F	372	9.0–58.0	9–2000	0.0177	0.0164	0.0192	2.9366	2.9124	2.9608	A⁻	−5.1497	s	0.99
	M	289	10.0–49.0	16–1536	0.0232	0.0214	0.0251	2.8434	2.8185	2.8683	A⁻	−12.395	s	0.99
Cartilaginous fishes														
Centrophorus granulosus	**C**	**98**	**37.0–105.0**	**255–5482**	**0.002**	**0.0013**	**0.0032**	**3.2312**	**3.1317**	**3.3308**	**A⁺**	**4.6116**	**s**	**0.98**
Chimaera monstrosa	**C**	**310**	**5.0–79.5**	**8–1304**	**0.078**	**0.0686**	**0.0878**	**2.9566**	**2.911**	**3.002**	**I**	**−1.8924**	**ns**	**0.98**
Dalatias licha	**C**	**81**	**30.5–104.0**	**124–5444**	**0.003**	**0.0023**	**0.0049**	**3.0795**	**2.9906**	**3.1685**	**I**	**1.7793**	**ns**	**0.98**
Etmopterus spinax	F	1174	8.0–52.5	2–390	0.004	0.0041	0.0048	3.0076	2.9828	3.0323	I	0.6013	ns	0.98
	M	475	8.5–44.0	3–275	0.006	0.0048	0.0063	2.9255	2.8837	2.9672	A⁻	−3.5115	s	0.98
Galeus melastomus	F	3868	9.0–55.0	2–569	0.003	0.0031	0.0033	2.9835	2.9742	2.9929	A⁻	−3.455	s	0.99
	M	4059	9.0–51.0	2–452	0.004	0.0039	0.0042	2.9095	2.9	2.919	A⁻	−18.661	s	0.99
Heptranchias perlo	**C**	**38**	**37.0–105.0**	**188–3047**	**0.005**	**0.0022**	**0.0106**	**2.9044**	**2.714**	**3.0948**	**I**	**−1.0477**	**ns**	**0.98**
Mustelus mustelus	C	208	27.5–135.0	58–8000	0.003	0.0024	0.0032	3.0269	2.989	3.0647	I	1.4	ns	0.99
Mustelus punctulatus	C	42	45.5–98.0	303–2700	0.007	0.0035	0.0136	2.7969	2.6338	2.96	A⁻	−2.5601	s	0.63
Scyliorhinus canicula	F	1537	10.5–48.0	30–394	0.001	0.0013	0.0015	3.2472	3.228	3.2663	A⁺	25.26	s	0.99
	M	1774	10.0–51.5	30–431	0.002	0.0018	0.002	3.1375	3.1216	3.1534	A⁺	16.98	s	0.99
Squalus blainville	F	1282	17.5–75.0	24–2451	0.003	0.0032	0.0036	3.0816	3.0646	3.0986	A⁺	9.4098	s	0.99
	M	970	16.5–77.0	22–2924	0.005	0.0045	0.0051	2.9834	2.9652	3.0016	A⁻	−1.7932	s	0.99

Linear regressions were significant for all species ($p < 0.05$), with R^2 values ranging from 0.86 to 0.99, except for *Mustelus punctulatus* (Risso, 1826), for which a value of 0.63 was estimated. The intercept (a) of LWR ranged between 0.0003 for *Lepidopus caudatus* Euphrasen, 1788 (both male and combined LWR) and 0.4677 for combined LWR of *Eledone moschata* (Lamarck, 1798). On the other hand, the slope (b) ranged from 2.1281 for the female specimens of *Aristeus antennatus* (Risso, 1816) to 3.306 for *Sardina pilchardus* (Walbaum, 1792) (sex combined). Overall the results of the growth pattern showed that 45.8% of LWRs exhibited negative allometric, 33.4% positive and 20.8% isometric. As for cephalopods and crustaceans concern, the most represented growth type was the negative allometry, with values of 67% and 78%, respectively. Concerning the fishes (bony and cartilaginous combined), it was observed the same percentage for positive and negative allometry, namely 37%, whereas the isometric growth represents 26% of the total.

4. Discussion

The comparison of the LWRs parameters estimated in the present study with others carried out in the Strait of Sicily highlighted that 14 LWRs represent the first references in the area. For the other 38 species, a comparison is provided in Table S1. However, for *Zeus faber* (Linnaeus, 1758), *M. punctulatus,* and *Squalus blainville* (Risso, 1827), this comparison was not carried out due to the lack of available literature. The growth types herein provided were in disagreement with Froese [2], who reported that most of the fishes showed isometric growth.

The outcomes of the *t*-test revealed that most of the LWRs (about 55%) reported in this study are in disagreement with those obtained previously by other authors from the Strait of Sicily [24,26,27,40,44,49,53,55–60].

The main differences were due to the estimations of the b parameter, which in some cases resulted lower than those reported in the literature. This might be linked to the sampling methodology; indeed, in the present study, the data from the MEDITS survey (fisheries independent) were analyzed, while most of the compared studies used samples coming from trawling and/or small scale commercial fisheries (fisheries dependent). As a matter of fact, the low selectivity of the gear used during the MEDITS survey allowed to sample representative size distribution of the population where the bulk of the catch is constituted by the juvenile fraction. In addition, since the MEDITS survey investigates a wide and heterogeneous area, from inshore to offshore waters, another plausible source of bias may be due to the habitat type sampled: for example, younger individuals may be more prevalent at shallower depths than in deeper waters. In this regard, it is important to point out that for comparison purposes, LWRs should be of similar size classes, the same units (e.g., grams and centimeters) [13,61] or measurement type (e.g., TL and SL-standard length or TW and eviscerated weight). In addition, LWRs are not constant throughout the year, varying seasonally in relation to many factors such as temperature, salinity, food (quantity, quality and size), habitat, gonad development, sex, fishing time, fishing gear, and area [2,49,62,63] Moreover, for cephalopods, the differences might also be related to the conservation modality. Indeed, as suggested by Massi [64], the freezing process leads to an elongation of muscular tissue that may affect the measurement of ML. This could explain the different growth types found between sexes of the *I. coindetii*, where the females and males showed negative and positive allometry, respectively.

To the best of our knowledge, many studies compare the LWRs parameters without any statistical approach (i.e., through "visual inspection"), which often results in no reliability to detect the differences. Therefore, the methodology adopted in this study should be desirable in order to identify differences in a and b parameters between LWRs objectively. An evident example of the possible bias introduced by the absence of a statistical approach is provided by the comparison of the growth parameters between the present study and Di Maio et al. [27]. Indeed, although Di Maio et al. [27], analyzing the size structure of spawning aggregation of *Pagellus acarne* (Risso, 1827), reports a value of b much higher than that reported in the present study, the *t*-test does not detect significant differences. This methodology is very important in the shared stocks because it would allow obtaining unique and more accurate LWRs (calculated as the geometric mean of a and b) for the purpose of stock assessment.

5. Conclusions

The results obtained from this study will contribute to filling the knowledge gap of fish populations in this area and also assist fisheries scientists in future stock assessment studies, with particular attention to heavily exploited populations, as well as those under stock recovery plans or other management and conservation programs.

In addition, the statistical approach proposed here could represent a useful tool to compare LWRs estimated from specimens of different size classes, seasons, or areas.

Finally, to obtain a more accurate estimation of LWRs parameters, especially in shared stock, it would be desirable that in the future, other authors use a similar statistical approach to that reported in the present study.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/fishes7020092/s1, Table S1: Comparison of available Length-Weight relationships from the South of Sicily. SEX: F—female, M—male and C—combined; N: the sample size; a: the intercept of the regression curve; b: the regression slope; R^2: the coefficient of determination, n.a.: not available, T.G.: Type of growth, A^- negative allometry, A^+ positive allometry and I isometric. Trawl: c-commercial, s—survey. In bold are reported the significant difference

(t-test $p < 0.05$) LWRs compared to the present study. In italic is the species for which the literature comparison was not available.

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Data Availability Statement: The dataset analyzed during the current study is available from the corresponding author on reasonable request.

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