Journal of Applied Ichthyology

J. Appl. Ichthyol. (2014), 1–6

ISSN 0175–8659

*Received: February 4, 2014*
*Accepted: May 1, 2014*
doi: 10.1111/jai.12497

## Technical contribution

# Weight–length and length–length relationships for reef fish species from the Cape Verde Archipelago (tropical north-eastern Atlantic)

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### Summary

This study reports weight–length and length–length relationships for selected coastal reef fish species of the Cape Verde Archipelago (tropical north-eastern Atlantic). Specimens were caught with different types of gear (long-lines, hand-lines, purse-seines and traps) during commercial fishing activities and sampled during fish market operations. A total of 8328 individuals were sampled, representing 29 species from 14 Families. This study provides the first references on weight–length and length–length relationships for five and 23 fish species worldwide, for 10 and 24 species for the Eastern Atlantic and for 12 and 26 species for Cape Verde Archipelago, respectively. Additionally, it provides revised weight–length relationships for 11 species from Cape Verde waters.

### Introduction

Weight–length relationships (WLRs) and length–length relationships (LLRs) have diverse applications, namely for studies on fish biology, physiology, ecology, and fisheries assessment (Santos et al., 2002). This is because size is generally more biologically relevant than age; consequently, variability in size has important implications for diverse aspects of fisheries science and population dynamics (Erzini, 1994).

The Cape Verde Archipelago is composed of ten islands (and thirteen islets), located 750 km off Senegal (west coast of Africa), between 15 and 17°N and 22–25°W (Santos et al., 2013). Local fisheries are predominantly small-scale and artisanal, aiming to supply the local markets and occurring mostly on near-shore reefs, as the continental shelf is narrow. Although several researchers have studied the ichthyofauna of the Cape Verde Islands, basic biological knowledge is still lacking. The present study was conducted because the LWRs were missing for many species of the local reef assemblages, which were the subject of a comparative study between natural and artificial reefs of the Santa Maria Bay (Santos et al., 2013). Therefore the present study represents a new contribution on LWRs for 23 and the LLRs of 26 reef fish species.

### Materials and methods

Data reported in the present study were collected between June 2008 and June 2013. Data collection was undertaken during periodic (monthly and/or seasonal) size sampling surveys in markets and landing ports, carried out by the Rebuilding Nature project research team and local INDP (*Instituto Nacional de Desenvolvimento das Pescas*) technicians. Specimens were caught with several different types of fishing gear, namely, hand-lines, bottom long-lines, and purse-seines, at a wide bathymetric range and covering all seasons of the year. The nomenclature adopted was that of FishBase (Froese and Pauly, 2014; accessed in December 2013).

Fish fork length (FL) and total length (TL) was measured with an ichthyometer to the nearest millimeter (mm); individual of less than and over 2 kg, respectively, were weighed on a top loading digital balance with a precision of 1–10 g.

Total length–fork length relationships (TFLRs) were calculated for each species using linear regression analysis with the equations $TL = a + bFL$, where $TL$ is the fish total length (cm) and $FL$ is the fish fork length (cm), $a$ is the intercept of the regression and $b$ is the coefficient of the regression. The weight–length relationships were estimated following the most common approach (Froese, 2006), using the *log* form of the equation: $W = aTL^b$, where $W$ is the total weight (g) and $TL$ is the fish total length (cm), $a$ is the intercept of the regression and $b$ is the coefficient of the regression (growth coefficient, i.e. fish relative growth rate). The allometry coefficient was expressed by $b$ coefficient of the WLRs. In order to confirm whether $b$ values obtained were significantly different from the isometric value (3), a $t$-test ($H_0$: $b = 3$) with a confidence level of ±95% ($\alpha = 0.05$) was applied (Sokal and Rohlf, 1987). Additionally, for both WLRs and TFLRs, 95% confidence limits of the parameters $a$ and $b$ were estimated. Goodness-of-fit of the regressions were given by the coefficients of determination ($r^2$), and the statistical significance were assessed with ANOVA tables ($F$-tests). The regression analysis was carried out using the R language for statistical computing version 3.0.1 (R Core Team, 2013).

Table 1
Descriptive statistics and weight–length relationship (WLR) parameters for 23 fish species caught off Cape Verde archipelago coast (tropical Northeastern Atlantic)

| Family/Scientific name | Species common name | N | TL, mean ± SD ($TL_{Min}$–$TL_{Max}$) | W, mean ± SD ($W_{Min}$–$W_{Max}$) | WLR equation | Determination coefficient ($r^2$) | SE of $b^1$ (95% CI of b) | Notes |
|---|---|---|---|---|---|---|---|---|
| Balistidae | | | | | | | | |
| *Balistes punctatus* | (Bluespotted triggerfish) | 122 | 32.7 ± 11.39 (15.7–51.8) | 901.7 ± 709.78 (82–2478) | $W = 0.0585TL^{2.6936}$ | 0.9931 | 0.0205 (2.6531–2.7342) | d |
| Carangidae | | | | | | | | |
| *Decapterus punctatus* | (Round scad) | 138 | 18.2 ± 6.69 (8.3–31) | 89.1 ± 86.18 (5–343) | $W = 0.0084TL^{3.0666}$ | 0.9922 | 0.0234 (3.0203–3.1128) | d |
| *Seriola fasciata* | (Lesser amberjack) | 50 | 47.8 ± 10.13 (30.5–65) | 1893.6 ± 1190.67 (460–4500) | $W = 0.0125TL^{3.0475}$ | 0.9702 | 0.0770 (2.8926–3.2023) | d |
| *Trachinotus ovatus* | (Pompano) | 33 | 27.9 ± 8.12 (15.7–44) | 199.1 ± 175.59 (32–650) | $W = 0.0089TL^{2.9370}$ | 0.9443 | 0.1281 (2.6757–3.1984) | c |
| Centracanthidae | | | | | | | | |
| *Spicara melanurus* | (Blackspot picarel) | 1569 | 26.4 ± 2.31 (18.2–32.8) | 251.3 ± 56.57 (87–425) | $W = 0.0713TL^{2.4915}$ | 0.9215 | 0.0184 (2.4555–2.5276) | a |
| Haemulidae | | | | | | | | |
| *Parapristipoma octolineatum* | (African striped grunt) | 65 | 25.5 ± 3.37 (19.7–31.6) | 219.4 ± 86.6 (96–404) | $W = 0.00937TL^{3.0916}$ | 0.9865 | 0.0456 (3.0005–3.1828) | a |
| *Pomadasys incisus* | (Bastard grunt) | 41 | 33.5 ± 15.52 (7.6–53.5) | 717.4 ± 533.29 (6–1873) | $W = 0.0160TL^{2.9275}$ | 0.9991 | 0.0137 (2.8998–2.9552) | d |
| Holocentridae | | | | | | | | |
| *Myripristis jacobus* | (Blackbar soldierfish) | 37 | 19.1 ± 1.46 (15.1–21.7) | 124.1 ± 29.44 (67–187) | $W = 0.01476TL^{3.0563}$ | 0.9464 | 0.1229 (2.8061–3.3059) | b |
| *Sargocentron hastatum* | (Red squirrelfish) | 130 | 20.7 ± 3.9 (13.1–27.9) | 153.8 ± 79.16 (37–347) | $W = 0.0309TL^{2.7786}$ | 0.9722 | 0.0415 (2.6965–2.8607) | d |
| Lethrinidae | | | | | | | | |
| *Lethrinus atlanticus* | (Atlantic emperor) | 236 | 27.5 ± 4.89 (12.8–41) | 311.1 ± 166.85 (35–950) | $W = 0.0155TL^{2.9622}$ | 0.9826 | 0.0258 (2.9114–3.0129) | d |
| Lutjanidae | | | | | | | | |
| *Apsilus fuscus* | (African forktail snapper) | 108 | 33.4 ± 10.71 (18.3–52.7) | 517.3 ± 470.07 (35–1586) | $W = 0.0049TL^{3.2023}$ | 0.9896 | 0.0319 (3.1391–3.2654) | c |
| *Lutjanus fulgens* | (Golden African snapper) | 214 | 27.9 ± 6.97 (15–43.3) | 346.1 ± 239.44 (42–1116) | $W = 0.0150TL^{2.9686}$ | 0.9888 | 0.0217 (2.9258–3.0114) | d |
| Mullidae | | | | | | | | |
| *Mulloidichthys martinicus* | (Yellow goatfish) | 235 | 31.3 ± 7.02 (18.9–44.8) | 463 ± 305.43 (66–1234) | $W = 0.0100TL^{3.0726}$ | 0.9839 | 0.0257 (3.0220–3.1233) | b |
| Muraenidae | | | | | | | | |
| *Gymnothorax vicinus* | (Purplemouth moray) | 2285 | 83.1 ± 12.61 (46.7–132) | 1001 ± 500.39 (140–3700) | $W = 0.0014TL^{3.0368}$ | 0.9207 | 0.0187 (3.0003–3.0734) | b |
| Pomacentridae | | | | | | | | |
| *Abudefduf saxatilis* | (Sergeant-major) | 55 | 14.8 ± 2.38 (10.1–20.1) | 73 ± 36.04 (21–183) | $W = 0.0187TL^{3.0392}$ | 0.9617 | 0.0833 (2.8721–3.2063) | b |
| *Chromis lubbocki* | (Lubbock's chromis) | 43 | 13.2 ± 0.63 (11.2–14.4) | 40.1 ± 5.74 (25–56) | $W = 0.0298TL^{2.7875}$ | 0.8677 | 0.1700 (2.4442–3.1307) | a |
| Scaridae | | | | | | | | |
| *Scarus hoefleri* | (Guinean parrotfish) | 27 | 51.8 ± 9.89 (32.5–66) | 2470.7 ± 1257.57 (690–4890) | $W = 0.0199TL^{2.9472}$ | 0.9764 | 0.0916 (2.7587–3.1357) | a |
| *Sparisoma cretense* | (Parrotfish) | 101 | 31.4 ± 6.67 (18.2–43) | 476.6 ± 275.96 (82–1090) | $W = 0.0148TL^{2.9755}$ | 0.9861 | 0.0355 (2.9050–3.0459) | b |
| *Sparisoma choati* | (Redfin parrotfish) | 54 | 38.9 ± 7.95 (24.3–50) | 974 ± 529.61 (215–1990) | $W = 0.0175TL^{2.9525}$ | 0.9795 | 0.0592 (2.8337–3.0712) | a |

Table 1
(Continued)

| Family/Scientific name | Species common name | N | TL, mean ± SD ($TL_{Min}$–$TL_{Max}$) | W, mean ± SD ($W_{Min}$–$W_{Max}$) | WLR equation | Determination coefficient ($r^2$) | SE of $b^1$ (95% CI of b) | Notes |
|---|---|---|---|---|---|---|---|---|
| Serranidae | | | | | | | | |
| *Cephalopholis taeniops* | (Bluespotted seabass) | 342 | 29.7 ± 6.36 (15–50.1) | 456.1 ± 375.12 (42–2100) | $W = 0.0065TL^{3.2400}$ | 0.9865 | 0.0206 (3.1995–3.2805) | d |
| Sparidae | | | | | | | | |
| *Diplodus fasciatus* | (Banded seabream) | 333 | 31.1 ± 7.13 (18.1–45) | 573.7 ± 373.26 (94–1558) | $W = 0.0228TL^{2.9057}$ | 0.9770 | 0.0245 (2.8575–2.9539) | d |
| *Diplodus prayensis* | (Two-banded seabream) | 603 | 24.8 ± 2.78 (15–29.8) | 258.2 ± 75.85 (54–432) | $W = 0.0142TL^{3.0423}$ | 0.9420 | 0.0308 (2.9818–3.1028) | d |
| *Diplodus sargus lineatus* | (White seabream) | 290 | 24.7 ± 4.75 (6.6–35) | 312.2 ± 173.89 (6–880) | $W = 0.0142TL^{3.0828}$ | 0.9764 | 0.0282 (3.0272–3.1384) | d |

N, sample size; L, total (TL) length (cm); W, total weight (g); Min, minimum; Max, maximum; SD, Standard deviation; SE, Standard error; CI, Confidence interval; *b*, slope.
Notes: a – first reference worldwide; b – first reference for Eastern Atlantic; c – first reference for Cape Verde Archipelago; d – revised WLR for Cape Verde waters.
[1]Refer to linear regression. Log *TW* = Log *a* + *b* Log*TL*.

Web database services were consulted for specific data on WRLs and LLRs, with particular emphasis on FishBase (Froese and Pauly, 2014). Due to statistical constraints in the WLRs, only species represented by at least 50 individuals and with a relatively broad size range were considered for estimation of the different relationships. The only exceptions to these criteria refer to selected fish species for which there were no WLRs reported in the literature or where the size range covered by the available WLRs was narrower.

## Results

We sampled a total of 8328 specimens belonging to 29 fish species across 14 families. Best represented was the family Sparidae (five species), followed by Carangidae (four species) and Haemulidae and Scaridae (three species). In numerical terms, best represented were *Gymnothorax vicinus* and *Spicara melanurus*, with 2285 and 1569 specimens, respectively, followed by *Diplodus prayensis* (603), *Cephalopholis taeniops* (342), *Diplodus fasciatus* (333), and *Lithognathus mormyrus* (306). Results obtained for the WLRs and TFLRs, respectively, for 23 and 26 selected coastal reef fish species along with several descriptive statistics, are given in Tables 1 and 2.

WLRs were highly significant ($P < 0.001$) for all 23 species. Determination coefficients ($r^2$) of the WLRs relationships ranged from 0.868 for *Chromis lubbocki* to 0.999 for *Pomadasys incisus*, corresponding to a mean value of 0.966 (±0.029). In addition, $r^2 > 0.900$ was found for 22 species (96%) and $r^2 > 0.950$ for 17 species (74%). The exponent *b* of weight–length relationships ranged from 2.492 for *Spicara melanurus* to 3.240 for *Cephalopholis taenops*, corresponding to a mean value of 2.9895 (±0.1566), meaning that all WLR slopes (*b*) were within the expected ranges ($2.5 < b < 3.5$; Carlander, 1969), with the exception of *S. melanurus*. In terms of growth type, these results revealed that five species (22%) showed negative allometries ($b < 3$, $P < 0.05$), 10 species (43%) showed isometric growth ($b = 3$, $P < 0.05$), with the remaining seven species (30%) showing positive allometries ($b > 3$, $P < 0.05$).

The TFLRs were highly significant ($P < 0.001$) for all 26 species. The determination coefficients ($r^2$) of the WLRs relationships ranged between 0.815 for *S. hastatum* and 0.999 for *P. incisus*, corresponding to a mean value of 0.974 (±0.040). In addition, $r^2 > 0.900$ was found for 25 species (96%) and $r^2 > 0.950$ for 22 species (85%). The *b* of the TFLRs ranged between 0.917 for *Parapristipoma octolineatum* and 1.244 for *S. melanurus*, corresponding to a mean value of 1.081 (±0.0915).

## Discussion

Because of fishing gear size selectivity, most samples do not include juveniles or very small sized individuals. Therefore, use of these WLRs and TFLRs should be limited to the size ranges applied in the estimation of the linear regression parameters, as suggested by Santos et al. (2002). Accordingly, their use is not recommended to extrapolate data to fish sizes outside the range used for their estimation (e.g.

Table 2
Descriptive statistics and total length-fork length relationship parameters for 26 fish species caught with several different fishing gears off the Cape Verde archipelago coast (Tropical North-eastern Atlantic)

| Family/Scientific name | Species common name | N | FL, mean ± SD ($FL_{Min}$–$FL_{Max}$) | TL, mean ± SD ($TL_{Min}$–$TL_{Max}$) | LL equation | Determination coefficient ($r^2$) | SE of $b^1$ (95% CI of b) | Notes |
|---|---|---|---|---|---|---|---|---|
| Acanthuridae | | | | | | | | |
| *Acanthurus monroviae* | (Monrovia doctorfish) | 282 | 29.9 ± 4.49 (17–39.1) | 32.8 ± 4.68 (19.1–42.6) | TL = 1.684 + 1.039FL | 0.9957 | 0.0041 (1.031–1.047) | a |
| Balistidae | | | | | | | | |
| *Balistes punctatus* | (Bluespotted triggerfish) | 11 | 31.4 ± 4.73 (25.5–38.5) | 33.5 ± 5.65 (26.4–42.2) | TL = −3.742 + 1.186FL | 0.9889 | 0.0419 (1.091–1.281) | a |
| Carangidae | | | | | | | | |
| *Caranx crysos* | (Blue runner) | 126 | 38.3 ± 8.95 (21–55.1) | 44.9 ± 10.47 (24.2–64.6) | TL = 0.167 + 1.168FL | 0.9964 | 0.0063 (1.156–1.181) | b |
| *Decapterus punctatus* | (Round scad) | 138 | 17 ± 6.51 (7.2–29.5) | 18.2 ± 6.69 (8.3–31) | TL = 0.763 + 1.026FL | 0.9970 | 0.0048 (1.017–1.036) | a |
| *Seriola fasciata* | (Lesser amberjack) | 17 | 37.5 ± 5 (30.8–49.3) | 44.3 ± 5.9 (36.1–56.8) | TL = 0.427 + 1.168FL | 0.9828 | 0.0400 (1.083–1.254) | a |
| *Trachinotus ovatus* | (Pompano) | 33 | 22.7 ± 6.63 (12.7–35.9) | 27.9 ± 8.12 (15.7–44) | TL = 0.143 + 1.223FL | | 0.0104 (1.202–1.244) | c |
| Centracanthidae | | | | | | | | |
| *Spicara melanurus* | (Blackspot picarel) | 23 | 23.9 ± 1.38 (21–25.5) | 26.7 ± 1.78 (23–28.9) | TL = −2.977 + 1.244FL | 0.9405 | 0.0683 (1.102–1.386) | a |
| Haemulidae | | | | | | | | |
| *Parapristipoma humile* | (Guinean grunt) | 166 | 24.9 ± 3.31 (18.9–33.3) | 26.4 ± 3.34 (20.1–34.6) | TL = 1.367 + 1.005FL | 0.9904 | 0.0077 (0.989–1.020) | a |
| *Parapristipoma octolineatum* | (African striped grunt) | 65 | 24.3 ± 3.67 (17.3–31.1) | 25.5 ± 3.37 (19.7–31.6) | TL = 3.242 + 0.917FL | 0.9925 | 0.0100 (0.897–0.937) | a |
| *Pomadasys incisus* | (Bastard grunt) | 41 | 31.3 ± 14.51 (7.2–49) | 33.5 ± 15.52 (7.6–53.5) | TL = 0.088 + 1.070FL | 0.9998 | 0.0021 (1.065–1.074) | a |
| Holocentridae | | | | | | | | |
| *Myripristis jacobus* | (Blackbar soldierfish) | 34 | 17 ± 1.51 (13.5–19.9) | 19.1 ± 1.45 (15.1–21.7) | TL = 3.360 + 0.928FL | 0.9360 | 0.0429 (0.840–1.015) | a |
| *Sargocentron hastatum* | (Red squirrelfish) | 45 | 19.6 ± 0.85 (18.3–21.4) | 21.3 ± 0.97 (19.5–23.5) | TL = 1.169 + 1.028FL | 0.8153 | 0.0746 (0.878–1.179) | a |
| Lethrinidae | | | | | | | | |
| *Lethrinus atlanticus* | (Atlantic emperor) | 231 | 25 ± 4.38 (11.7–36.8) | 27.3 ± 4.79 (12.8–41) | TL = 0.114 + 1.089FL | 0.9903 | 0.0071 (1.074–1.103) | a |
| Lutjanidae | | | | | | | | |
| *Apsilus fuscus* | (African forktail snapper) | 108 | 29.4 ± 9.13 (16.8–46.1) | 33.4 ± 10.71 (18.3–52.7) | TL = −0.997 + 1.170FL | 0.9935 | 0.0092 (1.152–1.188) | a |
| *Lutjanus fulgens* | (Golden African snapper) | 26 | 27.4 ± 5.93 (21.5–40.4) | 29 ± 6.53 (22.5–43.3) | TL = −1.222 + 1.101FL | 0.9975 | 0.0113 (1.078–1.124) | a |
| Mullidae | | | | | | | | |
| *Mulloidichthys martinicus* | (Yellow goatfish) | 206 | 28.9 ± 6.22 (16.8–39.8) | 32 ± 7.19 (18.9–44.8) | TL = −1.365 + 1.152FL | 0.9933 | 0.0066 (1.139–1.165) | a |
| *Pseudupeneus prayensis* | (West African goatfish) | 211 | 20.7 ± 3 (13.4–28) | 22.8 ± 3.17 (15.9–30.5) | TL = 1.356 + 1.037FL | 0.9638 | 0.0139 (1.010–1.065) | a |

Table 2
(Continued)

| Family/Scientific name | Species common name | N | FL, mean ± SD ($FL_{Min}$–$FL_{Max}$) | TL, mean ± SD ($TL_{Min}$–$TL_{Max}$) | LL equation | Determination coefficient ($r^2$) | SE of $b$[1] (95% CI of b) | Notes |
|---|---|---|---|---|---|---|---|---|
| Pomacentridae | | | | | | | | |
| *Abudefduf saxatilis* | (Sergeant-major) | 55 | 13.1 ± 2.07 (9.2–18) | 14.8 ± 2.38 (10.1–20.1) | TL = −0.0269 + 1.135FL | 0.9764 | 0.0243 (1.086–1.184) | a |
| *Chromis lubbocki* | (Lubbock's chromis) | 43 | 11.3 ± 0.63 (9.5–12.6) | 13.2 ± 0.63 (11.2–14.4) | TL = 2.337 + 0.961FL | 0.9042 | 0.0489 (0.862–1.060) | a |
| Scaridae | | | | | | | | |
| *Scarus hoefleri* | (Guinean parrotfish) | 27 | 46.6 ± 10.5 (26.5–61) | 51.8 ± 9.89 (32.5–66) | TL = 7.916 + 0.940FL | 0.9979 | 0.0086 (0.922–0.958) | a |
| *Sparisoma choati* | (Redfin parrotfish) | 26 | 39.9 ± 4.58 (28–47) | 41.6 ± 5.05 (29–49.5) | TL = −1.869 + 1.091FL | 0.9815 | 0.0306 (1.028–1.154) | a |
| Sparidae | | | | | | | | |
| *Diplodus fasciatus* | (Banded seabream) | 312 | 28 ± 6.85 (15.6–43.1) | 30.8 ± 7.16 (18.1–45) | TL = 1.782 + 1.037FL | 0.9869 | 0.0068 (1.024–1.051) | a |
| *Diplodus prayensis* | (Two-banded seabream) | 531 | 22.2 ± 2.72 (12.5–27) | 24.6 ± 2.87 (15–29.8) | TL = 1.626 + 1.038FL | 0.9686 | 0.0081 (1.022–1.054) | a |
| *Diplodus sargus lineatus* | (White seabream) | 258 | 22.2 ± 4.42 (5.8–31.8) | 24.8 ± 4.97 (6.6–35) | TL = 0.080 + 1.1147FL | 0.9799 | 0.0100 (1.094–1.134) | c |
| *Lithognathus mormyrus* | (Sand steenbras) | 306 | 24.9 ± 4.63 (14.6–31.2) | 27.1 ± 5.6 (15.1–34.9) | TL = −2.731 + 1.196FL | 0.9774 | 0.0104 (1.175–1.216) | a |
| *Virididentex acromegalus* | (Bulldog dentex) | 38 | 31.8 ± 6.71 (21.4–45.1) | 35.5 ± 6.99 (24.7–50) | TL = 2.424 + 1.039FL | 0.9916 | 0.0160 (1.006–1.071) | a |

N, sample size; TL, fish total length (cm); FL, fish fork length (cm); Min, minimum; Max, maximum; SD, Standard deviation; SE, Standard error; CI, Confidence interval; *b*, slope.
Notes: a – first reference worldwide; b – first reference for the Eastern Atlantic; c – first reference for the Cape Verde Archipelago.
[1]Refer to linear regression. $TL = a + bFL$.

larvae, juveniles/immature stages, etc.). Additionally, since samples were collected over an extended period of time, these WLRs are not representative of a particular season or time of the year and, for comparison purposes, should be considered as mean values as suggested by Petrakis and Stergiou (1995). In fact, as the food availability, feeding rate, gonad development and spawning period are not constant throughout the year (Bagenal and Tesch, 1978), WLRs may vary according to those factors. However, parameter *b* is usually species-specific (Mayrat, 1970) and generally does not vary significantly throughout the year, unlike parameter *a*, which may vary daily, seasonally, and/or among different habitats (Bagenal and Tesch, 1978).

The most frequently represented families in terms of species numbers did not show a consistent tendency in growth type among species, with the exception of the family Scaridae, whose species presented a consistent isometric growth. Comparison of these results was only possible with those reported by Pereira et al. (2011) for the Cape Verde waters, as other studies for the same area did not report the 95% confidence intervals for the *b* parameters. Similar results were found for *Sargocentron hastatum*, whereas differences (higher *b* values in the present study) were found for *C. taenops* and *Parapristipoma humile*. Although the *b* parameter generally does not vary significantly throughout the year, Pereira et al. (2011) based their results on a much lower number of sampled specimens.

Most of the previously available TFLRs for the studied species were based on measurements from a very limited number of photographs, with no descriptive statistics [see FishBase (Froese and Pauly, 2014)]. The exceptions were *Diplodus sargus lineatus* and *Trachinotus ovatus*, for which very similar values for the *b* parameter were provided by Morato et al. (2001) for the Azores Archipelago, and for *Caranx crysos* from the Caribbean (Thompson and Munro, 1974).

## Conclusion

His study provides further information on LWRs and LLRs of coastal reef fish species in Cape Verde waters, for which previous data were either limited in terms of their size range and number of specimens sampled, or in terms of the sampling period because samplings from previous studies were obtained on scientific cruises that covered limited time periods. To our knowledge, this study provides the first available references on WLRs for five fish species worldwide (Table 1 – Notes: *a*), for 10 species for the Eastern Atlantic (Table 1 – Notes: $a + b$), and for 12 species for the Cape Verde Archipelago (Table 1 – Notes: $a + b + c$). Furthermore, the study provides additional WLRs for 11 species of Cape Verde waters, based on a wider size range and seasonal coverage (Table 1 – Notes: *d*). As regards the TFLRs, this study provides the first reference for 23 species worldwide (Table 2 – Notes: *a*), for 24 species for the Eastern Atlantic (Table 2 – Notes: $a + b$), and for all 26 studied species for Cape Verde waters (Table 2 – Notes: $a + b + c$). Ideally, these results will contribute to future weight and length reconstitutions, diet studies, life history comparisons, biomass estimations and stock assessments.

## Acknowledgements

The authors would like to acknowledge the collaboration from many colleagues and friends, including Luis Bentes, Ailton Rocha and Tatiana Cabral, the staff of Manta Diving Center (Nuno Marques da Silva, Rute Portugal, Carla Santinho and Helena Moscoso), and Kevin Feldheim for revising the text. This study was mostly conducted within the scope of the project Rebuilding Nature – *Criação de recifes artificiais em Cabo Verde*, promoted by the Manta Diving Center and sponsored by Soltrópico, Banco Comercial Atlântico, Grupo Oásis Atlântico, CV Telecom and Supersub-Beuchat. Part of the data collection was carried out within the scope of the National fisheries data collection program, developed by INDP (Cape Verde). R. Coelho was supported by a grant from FCT (Ref: BPD 40523/2007) co-funded by 'POCI-2010 Programa Operacional Ciência e Inovação 2010' and 'FSE Fundo Social Europeu'.

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