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# Consumption to Biomass (Q/B) Ratio and Estimates of Q/B-predictor Parameters for Caribbean Fishes

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### Abstract

Estimates of the Q/B ratio and parameters of equations to 'predict' Q/B values for 116 fish stocks in the Gulf of Salamanca, Colombia are presented. A compilation of these estimates available for Caribbean Sea fishes (264 stocks) is also provided for comparison purposes. General trends in the value of Q/B resulting from differences in the equation and parameter values used are briefly discussed.

## Introduction

Consumption is one of the required input parameters for the construction of Ecopath (trophic) models (Christensen and Pauly 1993). In Ecopath, consumption (Q) of species or groups is expressed relative to their biomass (B) via Q/B. Consumption is the intake of food by a species/group over a time period, usually expressed on an annual basis (Christensen and Pauly 1993). The Q/B ratio has been defined as the number of times a population consumes its own weight in a year (see Pauly 1986).

A number of empirical approaches have been derived for the estimation of Q/B which make use of relatively easy-to-obtain parameters of fish populations (Palomares and Pauly 1989; Pauly 1989; Pauly et al. 1990; Jarre et al. 1991; Palomares and Pauly 1998). The vast majority of published Ecopath models have been constructed using empirically derived Q/B values (see Christensen and Pauly 1993). It is of considerable interest to explore the coherence of published Q/B and Q/B-predictor parameter values for the same species occurring in similar habitats. It is also useful to have a compilation of Q/B values for future use in the construction of Ecopath models. These can be used as input values in cases when local Q/B estimates are unavailable for the species or for comparison purposes. This paper gives a compilation of Q/B and Q/B-predictor parameters for fish stocks caught in the Caribbean, particularly from the Gulf of Salamanca (between latitude 11°00´-11°19´N and longitude 74°12´-74°50´W).

## Materials and Methods

Bottom trawl surveys were carried out in the Gulf of Salamanca during different time periods between 1995 and 1998 (García 1999). Demersal fishes were collected, counted, measured and a high proportion of the fish samples was photographed for estimation of the aspect ratio of their caudal fin. Asymptotic weight was obtained from asymptotic length using length-weight relationships (García et al. 1998; Duarte et al. 1999a) in cases where the parameters were available (Duarte et al. 1999b). In other cases asymptotic weight was estimated from maximum sizes caught using the relationship (Pauly 1984):

$$W_\infty = W_{max}/0.86$$

From the photographs, the aspect ratios were estimated using an image-analyzing program developed for the purpose (Matlab 5 software, MathWorks, Inc. 1998). As ambient bottom temperatures at capture were available, mean environmental temperature for each species was

computed for use in the predictive equations.

Stomach contents were also studied (Melo 1998; Navajas 1998; Duarte and García 1999a, 1999b; Duarte et al. 1999b; Schiller and García, in press) from which food type was assigned. Following Opitz (1996), the food type values were set based on the proportion of plants in the diet when estimating Q/B.

The study in Gulf of Salamanca resulted in independent Q/B estimates for 116 fish stocks. Q/B values and Q/B-predictor parameters for Caribbean fishes were compiled using Opitz (1996) as the main source, as most other work is not comprehensive or expresses Q/B values for aggregate species (groups) rather than for individual species. This resulted in compilation of parameters for 264 fish stocks. In order to assure comparability, the published Q/B-predictor parameters were used to re-estimate Q/B values of fish stocks obtained from the literature using often Q/B empirical equations.

For estimation of Q/B values, three empirical models were used: (1) Palomares and Pauly (1989); (2) Palomares and Pauly (1998); and (3) Pauly et al. (1990). These are expressed, respectively, in the form:

$$Q/B = 3.06 * W_\infty^{-0.2018} * Tc^{0.6121} * A^{0.5156} * 3.53^{HD} \quad ...(1)$$
$$Q/B = 10^{(7.964 - 0.204\log W_\infty - 1.965T + 0.083A + 0.532h + 0.398d)} \quad ...(2)$$
$$Q/B = 10^{6.37} * 0.0313^T * W_\infty^{-0.168} * 1.38^P * 1.89^{HD} \quad ...(3)$$

where: Q/B is the annual food consumption/biomass ratio of each fish population; $W_\infty$ is the asymptotic weight of the population (wet weight, in g); Tc is the mean annual habitat temperature for the fish population in question (in °C); T is the mean annual habitat temperature for the fish population expressed as $1,000/(Tc + 273.1)$; A is the aspect ratio of the caudal fin; HD is the feeding type (0 for carnivores and 1 for herbivores and detritivores); h and d are binary variables for types of food consumed (h=1, d=0 for herbivores; h=0, d=1 for detritivores; h=0, d=0 for carnivores); and P is a feeding type variable (1 for apex and/or pelagic predators and/or zooplankton feeders, and 0 for other feeding types).

These empirical models are described at length in Christensen and Pauly (1992). Model (1) is more often used in the published literature. Model (2) includes more cases and parameters than Model (1). Model (3) is employed for species that do not use their caudal fin as the (main) organ of propulsion and does not have a measure of aspect ratio. Instead, feeding type is used as predictor variable, which may also reflect activity levels of the fish. The transformation of mean habitat temperature suggested by Regier et al. (1990) was used for model (2) and (3).

## Results and Discussion

The resulting compilation of Q/B values and Q/B-predictor parameters for fishes with measures of the aspect ratio of the caudal fin are given in Table 1. Table 2, on the other hand, presents the Q/B values and related parameters for fishes without measures of the aspect ratio of the caudal fin.

It is interesting to note that there are differences in the value of Q/B estimates for the same species as a result of using different empirical formulas and in the predictor parameters used (for instance, in aspect ratios). The general trends in the value of Q/B resulting from use of different predictive equations and parameters are discussed in detail below.

It can be noted in Table 1 that there are differences in the measures of aspect ratio for the same species for instance *Haemulon aurolineatum*, *Echeneis naucrates* and several *Lutjanus* species. The differences may be due to the method used in measuring the height and surface area, the type of image (i.e., photograph or drawing), disposition of the caudal fin, and/or a combination of these factors. Palomares and Pauly (1998) provided two conditions to obtain a better estimate of the aspect ratio, i.e., (1) the disposition of the caudal fin in estimation should mimic the disposition during swimming, and (2) the surface area should be calculated extending to the narrowest part of the caudal peduncle.

$W_\infty$ is another Q/B-predictor parameter that was found to show some variations among the same fish species (see Tables 1 and 2). Although variations in $W_\infty$ can be due to different ecological conditions and level of exploitation, a significant part of this variation can also be attributed to differences in sampling procedures (including the variation introduced using different estimation methods). The vulnerability of fish to different sampling gears may vary and gears can be selective to a particular size range and hence may influence the $W_\infty$ estimates based on the size ranges of the collected fish samples. In this regard, it is suggested that the accuracy of $W_\infty$ estimates should be evaluated before they are used in the empirical models to predict Q/B.

The estimates of Q/B using Model (2) has consistently yielded relatively higher Q/B values (i.e., about 25% higher) when compared with the estimates using empirical Model (1). The empirical model presented in Palomares and Pauly (1998) was based on 108 cases including the 33 cases from Palomares and Pauly (1989). Hence, the empirical equation (Model 2) may be more robust and preferred for use in estimating Q/B values. It

is interesting to note that the effect of temperature on Q/B estimates was about two times as strong as the effect of aspect ratio (Palomares and Pauly 1998) however Palomares and Pauly (1989) concluded that aspect ratio alone has explained 50% of the variance of Q/B values.

In terms of the ranking of fish families based on the mean values of Q/B-predictor parameters, the first two columns in Table 3 show the ranking of the fish families in the Caribbean from highly to less active with aspect ratio as a measure of general activity of the fish. For example, Scombrids (which are classified as pelagic fish, with streamlined body shape, and active fishes) showed the highest mean aspect ratio. However, demersal representatives like bonefishes (Albulidae) and ladyfishes (Elopidae) ranked second to scombrids which may indicate that high activity seems not to be confined only to fishes in the pelagic environment. Jarre et al. (1991) mentioned that high values of aspect ratio may also occur among less active and deep-bodied fishes which would use their lobes that are spread apart to assure a stronger propulsive effect instead of caudal fins. This observation is not applicable in the case of Albulidae and Elopidae, which are elongate, but may rather be relevant for several carangid species. In view of this, Pauly (1989) and Jarre et al. (1991) explored the inclusion of other shape-related variables such as body depth and caudal peduncle height in the empirical equations. However, Palomares and Pauly (1998) concluded that such variables have no relation with Q/B once food type and temperature are properly accounted for. In addition, the use of aspect ratio as a Q/B-predictor parameter especially for empirical Models (1) and (2) has been emphasized.

Food type (as a proportion of plants in the diet) showed that species with higher proportion of plants in their diet tend to have higher estimated Q/B values (for example Engaulidae). The ranking according to the proportion of plants in diet (HD) also demonstrates the overwhelming prevalence of carnivores in Caribbean fishes, although a distinction should probably be made between families whose representatives preferentially inhabit seagrasses, benthic algal turfs and coral reefs where plant eating fish families are more common, as compared to pelagic and soft-bottom dwelling families where they tend to be carnivorous. It should be noted however that this trend does not include fishes in their early life stages, which are mainly herbivorous and plankton feeders.

Size distribution has been found to serve as ecological scaling factor that determines trophic energy flow within communities (see Dickie et al. 1987), hence ranking in terms of fish size may provide a rapid assessment of the role of fish families in a given ecosystem. However, larger fish for example family Ginglymostomidae tends to have a lower Q/B as compared to smaller fishes such as Engraulidae.

The compilation also indicates that some Q/B predictor parameters show different effects to estimates of Q/B values (i.e., mean aspect ratio has positive relation to Q/B while mean size have a negative relation to Q/B). For example, Scombridae have a higher mean aspect ratio than Albulidae and Elopidae, but they have a lower mean Q/B estimate than these families because scombrids are on the average much bigger than bonefishes and ladyfishes (see Table 3). This general trend further confirms the conclusion of Palomares and Pauly (1998) that asymptotic weight has a stronger effect on Q/B value than aspect ratio (as a measure of fish activity).

The compilation of Q/B ratio and Q/B-predictor parameters presented here should be useful for construction of Ecopath models particularly in tropical conditions. However, the variations of estimates of Q/B values and the influence of a particular Q/B-predictor parameter for a given fish species is a clear sign that care must be exerted when using the empirical models as well as the Q/B values presented here.

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## References

Abarca-Arenas, L.G. and E. Valero-Pacheco. 1993. Toward a trophic model of Tamiahua, a coastal lagoon in Mexico, p. 181-185. *In* V. Christensen and D. Pauly (eds.) Trophic models of aquatic ecosystems. ICLARM Conf. Proc. 26, 390 p.

Christensen, V. and D. Pauly. 1992. A guide to the ECOPATH II software system (version 2.1). ICLARM Software 6, 72 p.

Christensen, V. and D. Pauly, editors. 1993. Trophic models of aquatic ecosystems. ICLARM Conf. Proc. 26, 390 p.

Dickie, L.M., S.R. Kerr and P.R. Boudreu.

1987. Size-dependent processes underlying regularities in ecosystem structure. Ecol. Monogr. 57(3): 233-250.

Duarte, L.O. and C.B. García. 1999a. Diet of the mutton snapper *Lutjanus analis* (Cuvier) from the Gulf of Salamanca, Colombia, Caribbean Sea. Bull. Mar. Sci. 65(2): 453-465.

Duarte, L.O. and C.B. García 1999b. Diet of the lane snapper, *Lutjanus synagris* (Lutjanidae), in the Gulf of Salamanca, Colombia. Caribb. J. Sci. 35(1-2): 54-63.

Duarte, L.O., C.B. García, N. Sandoval, D. von Schiller, G. Melo and P. Navajas. 1999. Length-weight relationships of demersal fishes from the Gulf of Salamanca, Colombia. Naga, ICLARM Q. 22(1): 34-36.

Duarte, L.O., C.B. García, I. Moreno, N. Sandoval, P. Navajas, G. Melo and D. von Schiller. 1999. Atlas demográfico de los peces demersales del Golfo de Salamanca, Caribe colombiano: dinámica poblacional, distribución, alimentación y reproducción. CD-ROM

García, C.B. 1999. Estudio ecológico-pesquero de los recursos demersales del Golfo de Salamanca, Caribe Colombiano. Reporte Final COLCIENCIAS. Unpublished report.

García, C.B., L.O. Duarte, N. Sandoval, D. von Schiller, G. Melo and P. Navajas. 1998. Length-weight relationships of demersal fishes from the Gulf of Salamanca, Colombia. Naga, ICLARM Q. 21(3): 30-32.

Jarre, A., M.L. Palomares, M.L. Soriano, V.C. Sambilay and D. Pauly. 1991. Some new analytical and comparative methods for estimating the food consumption of fish. ICES Mar. Sci. Symp. 193: 99-108.

MathWorks, Inc. 1998. Matlab 5. The language of technical computing. Version 5.2.0.3084.

Melo, G. 1998. Caracterización trofica de los peces capturados con red de arrastre demersal en el Golfo de Salamanca, Caribe colombiano. Parte I, Facultad de Ciencias, Departamento de Biología, Universidad Javeriana. Tesis de Grado.

Navajas, P. 1998. Caracterización trofica de los peces capturados con red de arrastre demersal en el Golfo de Salamanca, Caribe colombiano. Parte II.Facultad de Ciencias, Departamento de Biología, Universidad Javeriana. Tesis de Grado.

Opitz, S. 1996. Trophic interactions in Caribbean coral reefs. ICLARM Tech. Rep. 43, 341 p.

Pauly, D. 1984. Fish population dynamics in tropical waters: a manual for use with programmable calculators. ICLARM Stud. Rev. 8, 325 p.

Pauly, D. 1986. A simple method for estimating the food consumption of fish population from growth data and food conversion experiments. Fish. Bull. 84(4): 827-840.

Pauly, D. 1989. Food consumption by tropical and temperate fish populations: some generalizations. J. Fish Biol. 35: 11-20.

Pauly, D., V. Christensen and V. Sambilay. 1990. Some features of fish food consumption estimates used by ecosystem modellers. ICES Counc. Meet. 1990/G: 17, 8 p.

Palomares, M.L. and D. Pauly. 1989. A multiple regression model for predicting the food consumption of marine fish populations. Aust. J. Mar. Freshwat. Res. 40: 259-273.

Palomares, M.L. and D. Pauly. 1998. Predicting food consumption of fish populations as functions of mortality, food type, morphometrics, temperature and salinity. Aust. J. Mar. Freshwat. Res. 49: 447-453.

Vega-Cendejas, M.E., F. Arreguin-Sanchez and M. Hernandez. 1993. Trophic fluxes on the Campeche Bank, Mexico, p. 206-213. *In* V. Christensen and D. Pauly (eds.) Trophic models of aquatic ecosystems. ICLARM Conf. Proc. 26, 390 p.

Regier, H.A., J.A. Holmes and D. Pauly. 1990. Influence of temperature changes on aquatic ecosystems: an interpretation of empirical data. Trans. Am. Fish. Soc. 119: 374-389.

Schiller, D.V. and C.B. García. Diet of *Balistes vetula* (Pisces: Balistidae) in the Gulf of Salamanca. Bol.Inst. Invest. Mar. Cost. (In press)

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*Table 1. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. For symbols see text.*

| Family | Species | AR[a] | T(°C)[b] | $W_\infty$ (g) | h | d | HD | Q/B[c] | Q/B[d] | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Acanthuridae | *Acanthurus bahianus* | 2.2 | 28.0 | 288.0 | 0.9 | 0.0 | 0.9 | 34.5 | 39.1 | Opitz (1996), Table 3.8 |
| | *Acanthurus bahianus* | 2.4 | 27.0 | 232.6 | 1.0 | 0.0 | 1.0 | 42.9 | 46.6 | This study |
| | *Acanthurus chirurgus* | 1.8 | 28.0 | 820.0 | 0.9 | 0.0 | 0.9 | 24.8 | 28.9 | Opitz (1996), Table 3.8 |
| | *Acanthurus chirurgus* | 1.9 | 27.5 | 1162.8 | 0.8 | 0.0 | 0.8 | 21.9 | 24.8 | This study |
| | *Acanthurus coeruleus* | 1.9 | 28.0 | 983.0 | 0.9 | 0.0 | 0.9 | 24.5 | 28.3 | Opitz (1996), Table 3.8 |
| Achiridae | *Achirus lineatus* | 1.5 | 27.2 | 87.2 | 0.0 | 0.0 | 0.0 | 11.6 | 14.2 | This study |
| Albulidae | *Albula nemoptera* | 4.4 | 27.5 | 662.8 | 0.0 | 0.0 | 0.0 | 13.5 | 16.5 | This study |
| | *Albula vulpes* | 5.0 | 27.3 | 1046.5 | 0.0 | 0.0 | 0.0 | 13.0 | 16.6 | This study |
| Antennariidae | *Antennarius multiocellatus* | 1.2 | 28.0 | 70.0 | 0.0 | 0.0 | 0.0 | 11.1 | 14.6 | Opitz (1996), Table 3.8 |
| | *Antennarius striatus* | 0.8 | 28.0 | 70.0 | 0.0 | 0.0 | 0.0 | 8.9 | 13.5 | Opitz (1996), Table 3.8 |
| Apogonidae | *Apogon conklini* *(Phaeoptyx conklini *)* | 1.7 | 28.0 | 3.3 | 0.0 | 0.0 | 0.0 | 24.5 | 29.9 | Opitz (1996), Table 3.8 |
| | *Apogon maculatus* | 1.5 | 28.0 | 37.0 | 0.0 | 0.0 | 0.0 | 14.1 | 17.6 | Opitz (1996), Table 3.8 |
| Ariidae | *Arius felis* | 1.9 | 26.0 | 343.0 | 0.0 | 0.0 | 0.0 | 9.7 | 10.9 | Vega-Cendejas et al. (1993), Table 4 |
| | *Bagre marinus* | 1.8 | 26.7 | 814.0 | 0.0 | 0.0 | 0.0 | 8.0 | 9.3 | This study |
| | *Cathorops spixii* | 1.9 | 26.0 | 434.0 | 0.0 | 0.0 | 0.0 | 9.2 | 10.4 | Vega-Cendejas et al. (1993), Table 4 |
| | *Cathorops spixii* | 2.4 | 25.7 | 233.5 | 0.0 | 0.0 | 0.0 | 11.6 | 12.7 | This study |
| Atherinidae | *Allanetta harringtonensis* | 1.7 | 28.0 | 11.0 | 0.0 | 0.0 | 0.0 | 19.2 | 23.4 | Opitz (1996), Table 3.8 |
| | *Atherinomorus stipes* | 1.9 | 28.0 | 16.0 | 0.0 | 0.0 | 0.0 | 18.6 | 22.4 | Opitz (1996), Table 3.8 |
| Aulostomidae | *Aulostomus maculatus* | 1.7 | 28.0 | 777.0 | 0.0 | 0.0 | 0.0 | 8.1 | 9.8 | Opitz (1996), Table 3.8 |
| Balistidae | *Balistes carolinensis* | 2.4 | 28.0 | 611.0 | 0.5 | 0.0 | 0.5 | 19.2 | 21.8 | Opitz (1996), Table 3.8 |
| | *Balistes carolinensis* | 1.9 | 27.1 | 1223.2 | 0.0 | 0.0 | 0.0 | 7.6 | 8.8 | This study |
| | *Balistes vetula* | 2.0 | 28.0 | 2586.0 | 0.1 | 0.0 | 0.1 | 8.0 | 9.4 | Opitz (1996), Table 3.8 |
| | *Balistes vetula* | 2.5 | 27.0 | 2441.9 | 0.0 | 0.0 | 0.0 | 7.7 | 8.7 | This study |
| | *Canthidermis sufflamen* | 1.7 | 28.0 | 4783.0 | 0.3 | 0.0 | 0.3 | 7.7 | 9.2 | Opitz (1996), Table 3.8 |
| | *Melichthys niger* | 2.3 | 28.0 | 960.0 | 0.8 | 0.0 | 0.8 | 23.3 | 26.3 | Opitz (1996), Table 3.8 |
| Batrachoididae | *Porichthys plectrodon* | 0.5 | 24.0 | 23.8 | 0.0 | 0.0 | 0.0 | 8.0 | 12.9 | This study |
| Belonidae | *Platybelone argalus argalus* | 2.7 | 28.0 | 150.0 | 0.0 | 0.0 | 0.0 | 14.1 | 16.4 | Opitz (1996), Table 3.8 |
| | *Strongylura notata* *(Strongylura notata notata*)* | 1.4 | 26.0 | 100.0 | 0.0 | 0.0 | 0.0 | 10.4 | 12.6 | Abarca-Arenas and Valero-Pacheco (1993), Table 1 |
| | *Strongylura timucu* | 1.7 | 28.0 | 110.0 | 0.0 | 0.0 | 0.0 | 11.9 | 14.5 | Opitz (1996), Table 3.8 |
| | *Tylosurus crocodilus* *(Tylosurus crocodilus crocodilus*)* | 3.1 | 28.0 | 1400.0 | 0.0 | 0.0 | 0.0 | 9.8 | 11.4 | Opitz (1996), Table 3.8 |
| Blenniidae | *Entomacrodus nigricans* | 1.0 | 28.0 | 13.0 | 0.8 | 0.0 | 0.8 | 40.9 | 55.4 | Opitz (1996), Table 3.8 |
| | *Ophioblennius atlanticus* | 0.9 | 28.0 | 35.0 | 0.9 | 0.0 | 0.9 | 32.9 | 46.0 | Opitz (1996), Table 3.8 |
| | *Parablennius marmoreus* | 1.3 | 28.0 | 10.0 | 0.7 | 0.0 | 0.7 | 39.8 | 50.9 | Opitz (1996), Table 3.8 |
| | *Scartella cristata* | 1.2 | 28.0 | 27.0 | 0.9 | 0.0 | 0.9 | 39.5 | 51.0 | Opitz (1996), Table 3.8 |
| Bothidae | *Bothus lunatus* | 1.1 | 28.0 | 3000.0 | 0.0 | 0.0 | 0.0 | 4.9 | 6.6 | Opitz (1996), Table 3.8 |
| | *Bothus ocellatus* | 1.5 | 28.0 | 180.0 | 0.0 | 0.0 | 0.0 | 10.2 | 12.7 | Opitz (1996), Table 3.8 |
| Callionymidae | *Diplogrammus pauciradiatus* | 0.6 | 20.0 | 1.0 | 0.0 | 0.0 | 0.0 | 14.7 | 20.5 | Pauly (1989), Table 2 |
| Carangidae | *Alectis ciliaris* | 4.8 | 28.0 | 10700.0 | 0.0 | 0.0 | 0.0 | 8.1 | 10.4 | Opitz (1996), Table 3.8 |
| | *Caranx bartholomei* | 4.1 | 28.0 | 9862.0 | 0.0 | 0.0 | 0.0 | 7.6 | 9.1 | Opitz (1996), Table 3.8 |
| | *Caranx bartholomei* | 3.2 | 26.4 | 2616.3 | 0.0 | 0.0 | 0.0 | 8.5 | 9.5 | This study |
| | *Caranx crysos* | 4.2 | 28.0 | 2314.0 | 0.0 | 0.0 | 0.0 | 10.3 | 12.6 | Opitz (1996), Table 3.8 |
| | *Caranx crysos* | 4.1 | | | | | | | | Jarre et al. (1991), Table 2 |

Note:
[a] Aspect ratio
[b] Mean habitat temperature
[c] Using Palomares & Pauly 1989 equation
[d] Using Palomares & Pauly 1998 equation
* valid name in FishBase

| Family | Species | AR[a] | T(°C)[b] | $W_\infty$ (g) | h | d | HD | Q/B[c] | Q/B[d] | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Caranx crysos* | 3.6 | 26.7 | 2558.1 | 0.0 | 0.0 | 0.0 | 9.0 | 10.3 | This study |
| | *Caranx hippos* | 3.8 | 28.0 | 8490.0 | 0.0 | 0.0 | 0.0 | 7.5 | 8.9 | Opitz (1996), Table 3.8 |
| | *Caranx hippos* | 3.6 | 27.4 | 1511.6 | 0.0 | 0.0 | 0.0 | 10.2 | 11.8 | This study |
| | *Caranx latus* | 4.5 | 28.0 | 6250.0 | 0.0 | 0.0 | 0.0 | 8.7 | 10.9 | Opitz (1996), Table 3.8 |
| | *Caranx latus* | 4.3 | 28.7 | 337.2 | 0.0 | 0.0 | 0.0 | 15.7 | 19.8 | This study |
| | *Caranx lugubris* | 5.5 | 28.0 | 6554.0 | 0.0 | 0.0 | 0.0 | 9.6 | 13.0 | Opitz (1996), Table 3.8 |
| | *Caranx ruber* | 4.5 | 28.0 | 3160.0 | 0.0 | 0.0 | 0.0 | 10.1 | 12.6 | Opitz (1996), Table 3.8 |
| | *Caranx ruber* | 3.9 | 27.0 | 3036.0 | 0.0 | 0.0 | 0.0 | 9.2 | 10.8 | Palomares and Pauly (1989), Table 2 |
| | *Chloroscombrus chrysurus* | 4.1 | 26.4 | 388.4 | 0.0 | 0.0 | 0.0 | 14.1 | 16.4 | This study |
| | *Decapterus macarellus* | 3.8 | 28.0 | 750.0 | 0.0 | 0.0 | 0.0 | 12.3 | 14.7 | Opitz (1996), Table 3.8 |
| | *Decapterus punctatus* | 3.7 | 28.0 | 573.0 | 0.0 | 0.0 | 0.0 | 12.7 | 15.1 | Opitz (1996), Table 3.8 |
| | *Hemicaranx amblyrhyncus* | 2.3 | 27.7 | 965.1 | 0.0 | 0.0 | 0.0 | 8.9 | 10.3 | This study |
| | *Oligoplites saurus* | 3.1 | 28.0 | 334.0 | 0.0 | 0.0 | 0.0 | 13.1 | 15.2 | Opitz (1996), Table 3.8 |
| | *Oligoplites saurus* | 3.4 | 26.0 | 287.0 | 0.0 | 0.0 | 0.0 | 13.5 | 15.0 | Abarca-Arenas and Valero-Pacheco (1993), Table 1 |
| | *Selar crumenophthalmus* | 3.5 | 28.0 | 1240.0 | 0.0 | 0.0 | 0.0 | 10.7 | 12.6 | Opitz (1996), Table 3.8 |
| | *Selar crumenophthalmus* | 3.4 | 26.6 | 707.3 | 0.0 | 0.0 | 0.0 | 11.3 | 12.7 | This study |
| | *Selene brownii* | 3.4 | 25.6 | 729.2 | 0.0 | 0.0 | 0.0 | 11.0 | 12.0 | This study |
| | *Selene setapinnis* | 3.7 | 26.8 | 414.9 | 0.0 | 0.0 | 0.0 | 13.4 | 15.5 | This study |
| | *Selene vomer* | 4.2 | 26.8 | 997.5 | 0.0 | 0.0 | 0.0 | 12.0 | 14.3 | This study |
| | *Seriola dumerili* | 4.5 | 28.0 | 80000.0 | 0.0 | 0.0 | 0.0 | 5.2 | 6.5 | Opitz (1996), Table 3.8 |
| | *Seriola rivoliana* | 3.5 | 24.7 | 494.2 | 0.0 | 0.0 | 0.0 | 11.9 | 12.9 | This study |
| | *Trachinotus carolinus* | 2.7 | 27.4 | 3139.5 | 0.0 | 0.0 | 0.0 | 7.7 | 8.7 | This study |
| | *Trachinotus falcatus* | 3.9 | 28.0 | 36000.0 | 0.0 | 0.0 | 0.0 | 5.7 | 6.8 | Opitz (1996), Table 3.8 |
| | *Trachinotus falcatus* | 4.0 | 26.2 | 3953.5 | 0.0 | 0.0 | 0.0 | 8.7 | 10.0 | This study |
| | *Trachinotus goodei* | 5.0 | 28.0 | 3900.0 | 0.0 | 0.0 | 0.0 | 10.2 | 13.3 | Opitz (1996), Table 3.8 |
| | *Trachinotus goodei* | 4.5 | 28.1 | 808.1 | 0.0 | 0.0 | 0.0 | 13.2 | 16.5 | This study |
| Chaetodontidae | *Chaetodon aculeatus* | 1.9 | 28.0 | 19.0 | 0.0 | 0.0 | 0.0 | 17.8 | 21.5 | Opitz (1996), Table 3.8 |
| | *Chaetodon capistratus* | 2.5 | 28.0 | 120.0 | 0.0 | 0.0 | 0.0 | 14.4 | 16.8 | Opitz (1996), Table 3.8 |
| | *Chaetodon capistratus* | 2.6 | 26.6 | 104.7 | 0.0 | 0.0 | 0.0 | 14.5 | 16.2 | This study |
| | *Chaetodon sedentarius* | 2.3 | 28.0 | 130.0 | 0.0 | 0.0 | 0.0 | 13.5 | 15.8 | Opitz (1996), Table 3.8 |
| | *Chaetodon sedentarius* | 1.8 | 27.7 | 139.5 | 0.0 | 0.0 | 0.0 | 11.8 | 14.0 | This study |
| | *Chaetodon striatus* | 2.4 | 28.0 | 164.0 | 0.0 | 0.0 | 0.0 | 13.1 | 15.3 | Opitz (1996), Table 3.8 |
| Cirrhitidae | *Amblycirrhitus pinos* | 1.5 | 28.0 | 15.0 | 0.0 | 0.0 | 0.0 | 16.9 | 21.1 | Opitz (1996), Table 3.8 |
| Clinidae | *Labrisomus nuchipinnis* | 1.3 | 28.0 | 137.0 | 0.0 | 0.0 | 0.0 | 9.9 | 12.9 | Opitz (1996), Table 3.8 |
| Clupeidae | *Brevoortia patronus* | 1.7 | 25.0 | 362.0 | 0.0 | 0.0 | 0.0 | 8.8 | 9.8 | Palomares and Pauly (1989), Table 2 |
| | *Harengula clupeola* | 2.7 | 28.0 | 240.0 | 0.0 | 0.0 | 0.0 | 12.9 | 14.9 | Opitz (1996), Table 3.8 |
| | *Harengula humeralis* | 2.9 | 28.0 | 440.0 | 0.0 | 0.0 | 0.0 | 12.4 | 14.3 | Opitz (1996), Table 3.8 |
| | *Harengula jaguana* | 2.5 | 26.0 | 135.0 | 0.0 | 0.0 | 0.0 | 13.3 | 14.6 | Vega-Cendejas et al. (1993), Table 4 |
| | *Jenkinsia lamprotaenia* | 2.2 | 28.0 | 13.0 | 0.0 | 0.0 | 0.0 | 21.0 | 24.7 | Opitz (1996), Table 3.8 |
| | *Ophistonema oglinum* | 3.1 | 28.0 | 730.0 | 0.0 | 0.0 | 0.0 | 11.2 | 13.0 | Opitz (1996), Table 3.8 |
| | *Ophistonema oglinum* | 2.8 | 26.0 | 158.0 | 0.0 | 0.0 | 0.0 | 13.7 | 15.0 | Vega-Cendejas et al. (1993), Table 4 |
| | *Opisthonema oglinum* | 2.4 | 27.5 | 222.1 | 0.0 | 0.0 | 0.0 | 12.3 | 14.1 | This study |
| | *Pellona harroweri* | 1.6 | 26.7 | 81.4 | 0.0 | 0.0 | 0.0 | 12.2 | 14.4 | This study |
| Coryphaenidae | *Coryphaena hippurus* | 2.4 | | | | | | | | Jarre et al. (1991), Table 2 |
| | *Coryphaena hippurus* | 3.3 | 25.0 | 147000.0 | 0.0 | 0.0 | 0.0 | 3.7 | 3.9 | Palomares and Pauly (1989) |
| Dactylopteridae | *Dactylopterus volitans* | 1.6 | 28.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 6.6 | 8.1 | Opitz (1996), Table 3.8 |
| | *Dactylopterus volitans* | 1.6 | 25.7 | 139.5 | 0.0 | 0.0 | 0.0 | 10.5 | 12.1 | This study |
| Diodontidae | *Cyclichthys antennatus* | 1.4 | 28.0 | 1420.0 | 0.0 | 0.0 | 0.0 | 6.5 | 8.2 | Opitz (1996), Table 3.8 |
| | *Cyclichthys schoepfi* | 0.9 | | | | | | | | Jarre et al. (1991), Table 2 |
| | *Diodon holocanthus* | 1.4 | 28.0 | 11300.0 | 0.0 | 0.0 | 0.0 | 4.2 | 5.3 | Opitz (1996), Table 3.8 |
| | *Diodon holocanthus* | 1.6 | 27.4 | 1005.8 | 0.0 | 0.0 | 0.0 | 7.4 | 8.9 | This study |
| | *Diodon hystrix* | 1.1 | 28.0 | 18446.0 | 0.0 | 0.0 | 0.0 | 3.4 | 4.6 | Opitz (1996), Table 3.8 |
| Echeneidae | *Echeneis naucrates* | 1.1 | 28.0 | 2080.0 | 0.0 | 0.0 | 0.0 | 5.3 | 7.1 | Opitz (1996), Table 3.8 |

*Table 1. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. For symbols see text. (continued)*

| Family | Species | AR[a] | T(°C)[b] | W∞ (g) | h | d | HD | Q/B[c] | Q/B[d] | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Echeneis naucrates* | 0.8 | | | | | | | | Jarre et al. (1991), Table 2 |
| | *Echeneis naucrates* | 1.5 | 26.5 | 872.1 | 0.0 | 0.0 | 0.0 | 7.0 | 8.4 | This study |
| | *Remora remora* | 1.6 | 28.0 | 1700.0 | 0.0 | 0.0 | 0.0 | 6.7 | 8.2 | Opitz (1996), Table 3.8 |
| Elopidae | *Elops saurus* | 3.4 | 28.0 | 444.0 | 0.0 | 0.0 | 0.0 | 12.9 | 15.2 | Opitz (1996), Table 3.8 |
| | *Elops saurus* | 4.7 | 28.2 | 930.2 | 0.0 | 0.0 | 0.0 | 13.2 | 16.9 | This study |
| Emmelichthyidae | *Inermia vittata* | 2.9 | 28.0 | 282.0 | 0.0 | 0.0 | 0.0 | 13.1 | 15.2 | Opitz (1996), Table 3.8 |
| Engraulidae | *Anchoa lyolepis* | 1.8 | 28.0 | 8.0 | 1.0 | 0.0 | 1.0 | 73.3 | 85.8 | Opitz (1996), Table 3.8 |
| Ephippidae | *Chaetodipterus faber* | 3.1 | 28.0 | 9000.0 | 0.1 | 0.0 | 0.1 | 7.3 | 8.5 | Opitz (1996), Table 3.8 |
| | *Chaetodipterus faber* | 2.7 | 27.0 | 1207.3 | 0.1 | 0.0 | 0.1 | 10.5 | 11.8 | This study |
| Fistulariidae | *Fistularia tabacaria* | 1.7 | 28.0 | 10800.0 | 0.0 | 0.0 | 0.0 | 4.7 | 5.7 | Opitz (1996), Table 3.8 |
| | *Fistularia tabacaria* | 1.3 | 27.4 | 529.1 | 0.0 | 0.0 | 0.0 | 7.5 | 9.5 | This study |
| | *Fistularia petimba* | 1.3 | 27.0 | 465.0 | 0.0 | 0.0 | 0.0 | 7.6 | 9.6 | This study |
| Gerreidae | *Diapterus auratus* | 2.7 | 26.0 | 99.0 | 0.0 | 0.0 | 0.0 | 15.0 | 16.4 | Abarca-Arenas and Valero-Pacheco (1993), Table 1 |
| | *Diapterus auratus* | 3.2 | 27.6 | 581.4 | 0.0 | 0.0 | 0.0 | 11.8 | 13.6 | This study |
| | *Diapterus rhombeus* | 1.7 | 28.0 | 151.2 | 0.0 | 0.0 | 0.0 | 11.4 | 13.8 | This study |
| | *Eucinostomus argenteus* | 1.9 | 28.0 | 290.0 | 0.0 | 0.0 | 0.0 | 10.5 | 12.5 | Opitz (1996), Table 3.8 |
| | *Eucinostomus argenteus* | 3.5 | 26.0 | 29.0 | 0.0 | 0.0 | 0.0 | 21.6 | 24.2 | Vega-Cendejas et al. (1993), Table 4 |
| | *Eucinistomus argenteus* | 2.4 | 25.9 | 235.7 | 0.0 | 0.0 | 0.0 | 11.7 | 12.8 | This study |
| | *Eucinostomus gula* | 2.8 | 26.0 | 14.0 | 0.0 | 0.0 | 0.0 | 22.5 | 24.8 | Vega-Cendejas et al. (1993), Table 4 |
| | *Eucinostomus gula* | 2.2 | 26.8 | 278.0 | 0.0 | 0.0 | 0.0 | 11.1 | 12.5 | This study |
| | *Eugerres plumieri* | 2.4 | 26.1 | 504.3 | 0.0 | 0.0 | 0.0 | 10.2 | 11.2 | This study |
| | *Gerres cinereus* | 3.9 | 28.0 | 690.0 | 0.0 | 0.0 | 0.0 | 12.7 | 15.3 | Opitz (1996), Table 3.8 |
| | *Gerres cinereus* | 2.9 | 26.5 | 511.6 | 0.0 | 0.0 | 0.0 | 11.2 | 12.4 | This study |
| Gobiidae | *Coryphopterus glaucofraenum* | 1.1 | 28.0 | 10.5 | 0.4 | 0.0 | 0.4 | 26.9 | 36.0 | Opitz (1996), Table 3.8 |
| | *Gnatholepis thompsoni* | 1.0 | 28.0 | 4.1 | 0.7 | 0.0 | 0.7 | 39.3 | 54.9 | Opitz (1996), Table 3.8 |
| | *Gobiosoma evelynae* | 0.8 | 28.0 | 2.2 | 0.0 | 0.0 | 0.0 | 17.8 | 27.2 | Opitz (1996), Table 3.8 |
| Grammidae | *Gramma loreto* | 1.1 | 28.0 | 15.0 | 0.0 | 0.0 | 0.0 | 14.5 | 19.6 | Opitz (1996), Table 3.8 |
| | *Gramma melacara* | 1.4 | 28.0 | 30.0 | 0.0 | 0.0 | 0.0 | 13.9 | 17.8 | Opitz (1996), Table 3.8 |
| Grammistidae | *Rypticus saponaceus* | 1.4 | 28.0 | 685.0 | 0.0 | 0.0 | 0.0 | 7.4 | 9.4 | Opitz (1996), Table 3.8 |
| Haemulidae | *Anisotremus surinamensis* | 2.7 | 28.0 | 4770.0 | 0.0 | 0.0 | 0.0 | 7.1 | 8.1 | Opitz (1996), Table 3.8 |
| | *Anisotremus surinamensis* | 2.8 | 26.4 | 2325.6 | 0.0 | 0.0 | 0.0 | 8.1 | 8.9 | This study |
| | *Anisotremus virginicus* | 2.8 | 28.0 | 850.0 | 0.0 | 0.0 | 0.0 | 10.3 | 11.9 | Opitz (1996), Table 3.8 |
| | *Anisotremus virginicus* | 1.9 | 27.0 | 523.3 | 0.0 | 0.0 | 0.0 | 9.1 | 10.5 | This study |
| | *Conodon nobilis* | 1.2 | 25.8 | 1027.9 | 0.0 | 0.0 | 0.0 | 6.1 | 7.6 | This study |
| | *Haemulon album* | 2.8 | 28.0 | 5300.0 | 0.0 | 0.0 | 0.0 | 7.0 | 8.1 | Opitz (1996), Table 3.8 |
| | *Haemulon album* | 2.3 | 26.9 | 1133.7 | 0.0 | 0.0 | 0.0 | 8.5 | 9.6 | This study |
| | *Haemulon aurolineatum* | 2.4 | 28.0 | 188.0 | 0.0 | 0.0 | 0.0 | 13.0 | 15.1 | Opitz (1996), Table 3.8 |
| | *Haemulon aurolineatum* | 5.7 | 23.0 | 436.0 | 0.0 | 0.0 | 0.0 | 15.0 | 18.3 | Pauly (1989), Table 2 |
| | *Haemulon aurolineatum* | 2.1 | 26.3 | 424.4 | 0.0 | 0.0 | 0.0 | 9.7 | 10.9 | This study |
| | *Haemulon bonariense* | 2.5 | 28.0 | 385.0 | 0.0 | 0.0 | 0.0 | 11.2 | 13.0 | Opitz (1996), Table 3.8 |
| | *Haemulon carbonarium* | 2.8 | 28.0 | 861.0 | 0.0 | 0.0 | 0.0 | 10.3 | 11.9 | Opitz (1996), Table 3.8 |
| | *Haemulon carbonarium* | 2.5 | 28.4 | 441.9 | 0.0 | 0.0 | 0.0 | 11.2 | 13.1 | This study |
| | *Haemulon chrysargyreum* | 2.6 | 28.0 | 251.0 | 0.0 | 0.0 | 0.0 | 12.6 | 14.6 | Opitz (1996), Table 3.8 |
| | *Haemulon chrysargerium* | 1.6 | 28.0 | 139.5 | 0.0 | 0.0 | 0.0 | 11.0 | 13.6 | This study |
| | *Haemulon flavolineatum* | 2.5 | 28.0 | 480.0 | 0.0 | 0.0 | 0.0 | 10.8 | 12.5 | Opitz (1996), Table 3.8 |
| | *Haemulon flavolineatum* | 3.9 | 23.0 | 136.0 | 0.0 | 0.0 | 0.0 | 15.6 | 16.5 | Pauly (1989), Table 2 |
| | *Haemulon macrostomum (Haemulon macrostoma\*)* | 2.7 | 28.0 | 1795.0 | 0.0 | 0.0 | 0.0 | 8.6 | 10.0 | Opitz (1996), Table 3.8 |
| | *Haemulon melanurum* | 1.8 | 28.0 | 427.0 | 0.0 | 0.0 | 0.0 | 9.4 | 11.2 | Opitz (1996), Table 3.8 |
| | *Haemulon melanurum* | 1.7 | 28.0 | 383.7 | 0.0 | 0.0 | 0.0 | 9.3 | 11.3 | This study |
| | *Haemulon parrai (H.parra \*)* | 2.5 | 28.0 | 1265.0 | 0.0 | 0.0 | 0.0 | 9.0 | 10.4 | Opitz (1996), Table 3.8 |
| | *Haemulon plumieri* | 2.9 | 28.0 | 1360.0 | 0.0 | 0.0 | 0.0 | 9.4 | 10.9 | Opitz (1996), Table 3.8 |
| | *Haemulos plumieri* | 2.4 | 26.0 | 616.0 | 0.0 | 0.0 | 0.0 | 9.7 | 10.6 | Vega-Cendejas et al. (1993), Table 4 |

*Table 1. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. For symbols see text. (continued)*

| Family | Species | ARᵃ | T(°C)ᵇ | W∞ (g) | h | d | HD | Q/Bᶜ | Q/Bᵈ | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Haemulon plumieri* | 2.6 | 27.5 | 581.4 | 0.0 | 0.0 | 0.0 | 10.6 | 12.1 | This study |
| | *Haemulon sciurus* | 2.5 | 28.0 | 1185.0 | 0.0 | 0.0 | 0.0 | 9.0 | 10.4 | Opitz (1996), Table 3.8 |
| | *Haemulon sciurus* | 3.0 | 23.0 | 920.0 | 0.0 | 0.0 | 0.0 | 9.3 | 9.4 | Pauly (1989), Table 2 |
| | *Haemulon steindachneri* | 2.0 | 28.0 | 360.0 | 0.0 | 0.0 | 0.0 | 10.3 | 12.2 | Opitz (1996), Table 3.8 |
| | *Haemulon steindachneri* | 2.0 | 26.9 | 833.1 | 0.0 | 0.0 | 0.0 | 8.4 | 9.6 | This study |
| | *Haemulon striatum* | 1.8 | 28.0 | 400.0 | 0.0 | 0.0 | 0.0 | 9.6 | 11.5 | Opitz (1996), Table 3.8 |
| | *Orthopristis chrysoptera* | 2.5 | 28.0 | 900.0 | 0.0 | 0.0 | 0.0 | 9.5 | 11.0 | Opitz (1996), Table 3.8 |
| | *Orthopristis chrysoptera* | 1.8 | 26.0 | 249.0 | 0.0 | 0.0 | 0.0 | 9.9 | 11.3 | Vega-Cendejas et al. (1993), Table 4 |
| | *Orthopristis ruber* | 2.5 | 28.0 | 330.0 | 0.0 | 0.0 | 0.0 | 11.6 | 13.5 | Opitz (1996), Table 3.8 |
| | *Pomadasys corvinaeformis* | 1.3 | 25.8 | 249.7 | 0.0 | 0.0 | 0.0 | 8.5 | 10.3 | This study |
| Hemiramphidae | *Hemiramphus balao* | 2.7 | 28.0 | 614.0 | 0.0 | 0.0 | 0.0 | 10.8 | 12.5 | Opitz (1996), Table 3.8 |
| | *Hemiramphus brasiliensis* | 3.2 | 28.0 | 298.0 | 0.8 | 0.0 | 0.8 | 37.9 | 43.0 | Opitz (1996), Table 3.8 |
| Holocentridae | *Holocentrus ascensionis* | 2.6 | 28.0 | 838.0 | 0.0 | 0.0 | 0.0 | 10.0 | 11.5 | Opitz (1996), Table 3.8 |
| | *Holocentrus ascencionis* | 2.3 | 27.1 | 395.4 | 0.0 | 0.0 | 0.0 | 10.5 | 12.0 | This study |
| | *Holocentrus coruscus* | 3.0 | 28.0 | 57.0 | 0.0 | 0.0 | 0.0 | 18.4 | 21.5 | Opitz (1996), Table 3.8 |
| | *Holocentrus rufus* | 2.2 | 28.0 | 583.0 | 0.0 | 0.0 | 0.0 | 9.8 | 11.5 | Opitz (1996), Table 3.8 |
| | *Myripristis jacobus* | 2.5 | 28.0 | 397.0 | 0.0 | 0.0 | 0.0 | 11.2 | 13.0 | Opitz (1996), Table 3.8 |
| | *Myripristis jacobus* | 1.9 | 23.9 | 220.9 | 0.0 | 0.0 | 0.0 | 10.0 | 10.7 | This study |
| | *Neoniphon marianus* | 3.0 | 28.0 | 163.0 | 0.0 | 0.0 | 0.0 | 14.9 | 17.3 | Opitz (1996), Table 3.8 |
| | *Plectrypops retrospinis* | 1.7 | 28.0 | 57.0 | 0.0 | 0.0 | 0.0 | 13.8 | 16.8 | Opitz (1996), Table 3.8 |
| | *Sargocentron vexillarium* | 2.7 | 28.0 | 181.0 | 0.0 | 0.0 | 0.0 | 13.6 | 15.8 | Opitz (1996), Table 3.8 |
| Kyphosidae | *Kyphosus incisor* | 2.8 | 28.0 | 6122.0 | 1.0 | 0.0 | 1.0 | 24.4 | 27.1 | Opitz (1996), Table 3.8 |
| | *Kyphosus sectatrix* | 2.9 | 28.0 | 9139.0 | 1.0 | 0.0 | 1.0 | 22.8 | 25.3 | Opitz (1996), Table 3.8 |
| Labridae | *Bodianus rufus* | 1.2 | 28.0 | 1560.0 | 0.0 | 0.0 | 0.0 | 5.9 | 7.7 | Opitz (1996), Table 3.8 |
| | *Clepticus parrae* | 1.8 | 28.0 | 447.0 | 0.0 | 0.0 | 0.0 | 9.4 | 11.2 | Opitz (1996), Table 3.8 |
| | *Halichoeres bivittatus* | 1.3 | 28.0 | 230.0 | 0.0 | 0.0 | 0.0 | 8.9 | 11.6 | Opitz (1996), Table 3.8 |
| | *Halichoeres maculipinna* | 1.3 | 28.0 | 25.0 | 0.0 | 0.0 | 0.0 | 13.8 | 18.1 | Opitz (1996), Table 3.8 |
| | *Halichoeres poeyi* | 1.2 | 28.0 | 150.0 | 0.0 | 0.0 | 0.0 | 9.4 | 12.4 | Opitz (1996), Table 3.8 |
| | *Halichoeres radiatus* | 1.6 | 28.0 | 2283.0 | 0.0 | 0.0 | 0.0 | 6.3 | 7.7 | Opitz (1996), Table 3.8 |
| | *Lachnolaimus maximus* | 1.5 | 28.0 | 7728.0 | 0.0 | 0.0 | 0.0 | 4.8 | 5.9 | Opitz (1996), Table 3.8 |
| | *Thalassoma bifasciatum* | 1.1 | 28.0 | 97.0 | 0.0 | 0.0 | 0.0 | 9.7 | 13.3 | Opitz (1996), Table 3.8 |
| | *Xyrichtys novacula* | 1.5 | 28.0 | 230.0 | 0.0 | 0.0 | 0.0 | 9.6 | 12.0 | Opitz (1996), Table 3.8 |
| | *Xyrichtys splendens* | 1.5 | 28.0 | 50.0 | 0.0 | 0.0 | 0.0 | 13.1 | 16.4 | Opitz (1996), Table 3.8 |
| Lutjanidae | *Lutjanus analis* | 2.1 | 28.0 | 5511.0 | 0.0 | 0.0 | 0.0 | 6.0 | 7.0 | Opitz (1996), Table 3.8 |
| | *Lutjanus analis* | 1.8 | 26.7 | 12957.0 | 0.0 | 0.0 | 0.0 | 4.5 | 5.2 | This study |
| | *Lutjanus apodus* | 2.0 | 28.0 | 3502.0 | 0.0 | 0.0 | 0.0 | 6.5 | 7.6 | Opitz (1996), Table 3.8 |
| | *Lutjanus apodus* | 0.5 | 26.5 | 1337.2 | 0.0 | 0.0 | 0.0 | 3.8 | 6.5 | This study |
| | *Lutjanus bucanella* (L. buccanella*) | 1.3 | 27.0 | 34.9 | 0.0 | 0.0 | 0.0 | 12.6 | 16.0 | This study |
| | *Lutjanus campechanus* | 1.4 | 28.0 | 18000.0 | 0.0 | 0.0 | 0.0 | 3.9 | 4.9 | Opitz (1996), Table 3.8 |
| | *Lutjanus campechanus* | 1.4 | 20.0 | 13000.0 | 0.0 | 0.0 | 0.0 | 3.4 | 3.5 | Palomares and Pauly (1989), Table 2 |
| | *Lutjanus cyanopterus* | 2.2 | 28.0 | 70000.0 | 0.0 | 0.0 | 0.0 | 3.7 | 4.3 | Opitz (1996), Table 3.8 |
| | *Lutjanus cyanopterus* | 0.9 | 26.3 | 1058.1 | 0.0 | 0.0 | 0.0 | 5.3 | 7.2 | This study |
| | *Lutjanus griseus* | 2.1 | 28.0 | 1590.0 | 0.0 | 0.0 | 0.0 | 7.7 | 9.1 | Opitz (1996), Table 3.8 |
| | *Lutjanus griseus* | 1.5 | 25.8 | 1802.3 | 0.0 | 0.0 | 0.0 | 6.1 | 7.1 | This study |
| | *Lutjanus jocu* | 2.1 | 28.0 | 13380.0 | 0.0 | 0.0 | 0.0 | 5.0 | 5.9 | Opitz (1996), Table 3.8 |
| | *Lutjanus jocu* | 1.4 | 26.9 | 7441.9 | 0.0 | 0.0 | 0.0 | 4.5 | 5.5 | This study |
| | *Lutjanus mahogoni* | 2.1 | 28.0 | 980.0 | 0.0 | 0.0 | 0.0 | 8.5 | 10.0 | Opitz (1996), Table 3.8 |
| | *Lutjanus mahogoni* | 1.9 | 26.8 | 372.1 | 0.0 | 0.0 | 0.0 | 9.8 | 11.2 | This study |
| | *Lutjanus synagris* | 2.0 | 28.0 | 1213.0 | 0.0 | 0.0 | 0.0 | 8.0 | 9.4 | Opitz (1996), Table 3.8 |
| | *Lutjanus synagris* | 1.5 | 27.7 | 1352.3 | 0.0 | 0.0 | 0.0 | 6.7 | 8.3 | This study |
| | *Lutjanus vivanus* | 1.4 | 27.1 | 872.1 | 0.0 | 0.0 | 0.0 | 7.1 | 8.7 | This study |
| | *Ocyurus chrysurus* | 3.0 | 28.0 | 3570.0 | 0.0 | 0.0 | 0.0 | 7.9 | 9.1 | Opitz (1996), Table 3.8 |
| | *Pristipomoides aquilonaris* | 1.6 | 25.2 | 310.3 | 0.0 | 0.0 | 0.0 | 8.9 | 10.1 | This study |
| | *Pristipomoides macrophthalmus* | 1.6 | 28.0 | 441.9 | 0.0 | 0.0 | 0.0 | 8.8 | 10.8 | This study |
| | *Rhomboplites aurorubens* | 2.4 | 26.6 | 581.4 | 0.0 | 0.0 | 0.0 | 9.9 | 11.0 | This study |
| Malacanthidae | *Malacanthus plumieri* | 1.4 | 28.0 | 1126.0 | 0.0 | 0.0 | 0.0 | 6.8 | 8.6 | Opitz (1996), Table 3.8 |
| | *Caulolatilus guppyi* | 1.6 | 28.0 | 488.4 | 0.0 | 0.0 | 0.0 | 8.6 | 10.5 | This study |

Table 1. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. For symbols see text. *(continued)*

| Family | Species | AR[a] | T(°C)[b] | $W_\infty$ (g) | h | d | HD | Q/B[c] | Q/B[d] | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| Megalopidae | *Megalops atlanticus* | 3.0 | 28.0 | 160000.0 | 0.0 | 0.0 | 0.0 | 3.7 | 4.2 | Opitz (1996), Table 3.8 |
| | *Megalops atlanticus* | 2.8 | 27.6 | 1064.0 | 0.0 | 0.0 | 0.0 | 9.7 | 11.1 | This study |
| Monacanthidae | *Aluterus monoceros* | 1.7 | 28.0 | 2500.0 | 0.5 | 0.0 | 0.5 | 12.0 | 14.2 | Opitz (1996), Table 3.8 |
| | *Aluterus monoceros* | 1.2 | 27.8 | 1512.6 | 0.4 | 0.0 | 0.4 | 9.0 | 11.7 | This study |
| | *Aluterus schoepfii* | 0.7 | 28.0 | 1892.0 | 1.0 | 0.0 | 1.0 | 15.1 | 22.7 | Opitz (1996), Table 3.8 |
| | *Aluterus scriptus* | 0.7 | 28.0 | 2941.0 | 0.4 | 0.0 | 0.4 | 6.8 | 10.5 | Opitz (1996), Table 3.8 |
| | *Cantherihes macrocerus* | 1.5 | 28.0 | 2700.0 | 0.3 | 0.0 | 0.3 | 8.4 | 10.3 | Opitz (1996), Table 3.8 |
| | *Cantherihes pullus* | 1.5 | 28.0 | 220.0 | 0.4 | 0.0 | 0.4 | 16.4 | 20.3 | Opitz (1996), Table 3.8 |
| | *Monacanthus ciliatus* | 1.2 | 28.0 | 448.0 | 0.3 | 0.0 | 0.3 | 11.8 | 15.2 | Opitz (1996), Table 3.8 |
| | *Monacanthus tuckeri* | 1.4 | 28.0 | 24.0 | 0.3 | 0.0 | 0.3 | 21.5 | 27.3 | Opitz (1996), Table 3.8 |
| | *Stephanolepis settifer (s. hispidus\*)* | 0.9 | 28.0 | 133.7 | 0.0 | 0.0 | 0.0 | 8.2 | 12.0 | This study |
| Mugilidae | *Mugil curema* | 2.7 | 28.0 | 767.0 | 1.0 | 0.0 | 1.0 | 36.4 | 40.6 | Opitz (1996), Table 3.8 |
| | *Mugil curema* | 1.8 | 26.0 | 2400.0 | 1.0 | 0.0 | 1.0 | 22.6 | 24.6 | Abarca-Arenas and Valero-Pacheco (1993), Table 1 |
| | *Mugil cephalus* | 1.4 | | | | | | | | Jarre et al. (1991), Table 2 |
| Mullidae | *Mulloidichthys martinicus* | 2.3 | 28.0 | 440.0 | 0.0 | 0.0 | 0.0 | 10.5 | 12.2 | Opitz (1996), Table 3.8 |
| | *Pseudupeneus maculatus* | 2.3 | 28.0 | 393.0 | 0.0 | 0.0 | 0.0 | 10.8 | 12.6 | Opitz (1996), Table 3.8 |
| | *Pseudupeneus maculatus* | 1.6 | 26.3 | 331.4 | 0.0 | 0.0 | 0.0 | 9.1 | 10.5 | This study |
| | *Upeneus parvus* | 2.0 | 25.5 | 151.2 | 0.0 | 0.0 | 0.0 | 11.5 | 12.7 | This study |
| Myctophidae | *Myctophum asperum* | 1.3 | 25.0 | 8.0 | 0.0 | 0.0 | 0.0 | 16.4 | 19.7 | Palomares and Pauly (1989), Table 2 |
| | *Diaphus dumerilii* | 0.6 | 23.9 | 3.4 | 0.0 | 0.0 | 0.0 | 13.1 | 19.6 | This study |
| Ogcocephalidae | *Ogcocephalus nasutus* | 0.5 | 26.2 | 348.8 | 0.1 | 0.0 | 0.1 | 5.8 | 9.7 | This study |
| Opistognathidae | *Opistognathus aurifrons* | 0.8 | 28.0 | 30.0 | 0.0 | 0.0 | 0.0 | 10.8 | 16.1 | Opitz (1996), Table 3.8 |
| | *Opistognathus macrognathus* | 1.1 | 28.0 | 240.0 | 0.0 | 0.0 | 0.0 | 8.3 | 11.2 | Opitz (1996), Table 3.8 |
| | *Opistognathus whitehurstii* | 0.8 | 28.0 | 65.0 | 0.0 | 0.0 | 0.0 | 9.1 | 13.7 | Opitz (1996), Table 3.8 |
| | *Opistognathus maxillosus* | 0.8 | 28.0 | 15.0 | 0.0 | 0.0 | 0.0 | 11.8 | 18.3 | Opitz (1996), Table 3.8 |
| Ostraciidae | *Latophrys polygonius* | 1.2 | 28.0 | 2200.0 | 0.0 | 0.0 | 0.0 | 5.4 | 7.1 | Opitz (1996), Table 3.8 |
| | *Lactophrys polygonius* | 1.6 | 27.4 | 1264.4 | 0.6 | 0.0 | 0.6 | 14.8 | 17.4 | This study |
| | *Lactophrys quadricornis (Acanthostracion quadricornis\*)* | 1.1 | 28.0 | 3050.0 | 0.1 | 0.0 | 0.1 | 5.7 | 7.5 | Opitz (1996), Table 3.8 |
| | *Lactophrys quadricornis (Acanthostracion quadricornis\*)* | 1.5 | 26.0 | 296.0 | 0.0 | 0.0 | 0.0 | 8.8 | 10.4 | Vega-Cendejas et al. (1993), Table 4 |
| | *Lactophrys quadricornis (Acanthostracion quadricornis\*)* | 1.4 | 27.2 | 482.6 | 0.7 | 0.0 | 0.7 | 18.5 | 22.2 | This study |
| | *Lactophrys bicaudalis* | 1.2 | 28.0 | 5572.0 | 0.2 | 0.0 | 0.2 | 5.5 | 7.2 | Opitz (1996), Table 3.8 |
| | *Lactophrys bicaudalis* | 0.8 | 27.1 | 732.6 | 0.0 | 0.0 | 0.0 | 5.3 | 7.9 | This study |
| | *Lactophrys trigonus* | 1.9 | 28.0 | 3052.0 | 0.1 | 0.0 | 0.1 | 7.1 | 8.4 | Opitz (1996), Table 3.8 |
| | *Lactophrys triqueter* | 2.0 | 28.0 | 1394.0 | 0.0 | 0.0 | 0.0 | 8.0 | 9.4 | Opitz (1996), Table 3.8 |
| Paralichthyidae | *Syacium gunteri* | 1.1 | 26.9 | 40.7 | 0.0 | 0.0 | 0.0 | 11.4 | 15.0 | This study |
| | *Syacium micrurum* | 0.8 | 26.3 | 127.9 | 0.0 | 0.0 | 0.0 | 7.8 | 11.0 | This study |
| Pempheridae | *Pempheris schomburgki* | 2.3 | 28.0 | 100.0 | 0.0 | 0.0 | 0.0 | 14.2 | 16.6 | Opitz (1996), Table 3.8 |
| Pomacanthidae | *Centropyge argi* | 1.4 | 28.0 | 10.0 | 0.8 | 0.0 | 0.8 | 45.9 | 56.7 | Opitz (1996), Table 3.8 |
| | *Holacanthus ciliaris* | 1.3 | 28.0 | 1988.0 | 0.0 | 0.0 | 0.0 | 5.9 | 7.7 | Opitz (1996), Table 3.8 |
| | *Holacanthus tricolor* | 1.7 | 28.0 | 1306.0 | 0.0 | 0.0 | 0.0 | 7.3 | 8.8 | Opitz (1996), Table 3.8 |
| | *Pomacanthus arcuatus* | 2.9 | 28.0 | 12407.0 | 0.1 | 0.0 | 0.1 | 6.7 | 7.7 | Opitz (1996), Table 3.8 |
| | *Pomacanthus arcuatus* | 2.5 | 26.6 | 1046.5 | 0.1 | 0.0 | 0.1 | 9.9 | 11.0 | This study |
| | *Pomacanthus paru* | 1.8 | 28.0 | 2229.0 | 0.1 | 0.0 | 0.1 | 7.9 | 9.4 | Opitz (1996), Table 3.8 |
| | *Pomacanthus paru* | 1.8 | 26.7 | 3488.4 | 1.0 | 0.0 | 1.0 | 19.8 | 22.1 | This study |
| Polynemidae | *Polydactilus virginicus* | 1.8 | 26.6 | 273.3 | 0.0 | 0.0 | 0.0 | 10.0 | 11.6 | This study |
| Pomacentridae | *Abudefduf saxatilis* | 3.0 | 28.0 | 483.0 | 0.1 | 0.0 | 0.1 | 13.3 | 15.4 | Opitz (1996), Table 3.8 |
| | *Abudefduf taurus* | 2.0 | 28.0 | 900.0 | 0.9 | 0.0 | 0.9 | 28.0 | 31.9 | Opitz (1996), Table 3.8 |

*Table 1. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. For symbols see text. (continued)*

| Family | Species | ARᵃ | T(°C)ᵇ | W∞ (g) | h | d | HD | Q/Bᶜ | Q/Bᵈ | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Chromis cyanea* | 1.8 | 28.0 | 93.0 | 0.0 | 0.0 | 0.0 | 12.7 | 15.3 | Opitz (1996), Table 3.8 |
| | *Chromis multilineata* | 1.8 | 28.0 | 339.0 | 0.0 | 0.0 | 0.0 | 9.8 | 11.8 | Opitz (1996), Table 3.8 |
| | *Microspathodon chrysurus* | 1.9 | 28.0 | 412.0 | 0.8 | 0.0 | 0.8 | 25.9 | 30.0 | Opitz (1996), Table 3.8 |
| | *Stegastes fuscus* | 1.8 | 28.0 | 168.0 | 0.5 | 0.0 | 0.5 | 21.7 | 25.6 | Opitz (1996), Table 3.8 |
| | *Stegastes leucostictus* | 1.3 | 28.0 | 50.0 | 0.2 | 0.0 | 0.2 | 15.8 | 20.3 | Opitz (1996), Table 3.8 |
| | *Stegastes planifrons* | 1.4 | 28.0 | 68.0 | 0.3 | 0.0 | 0.3 | 16.2 | 20.5 | Opitz (1996), Table 3.8 |
| | *Stegastes variabilis* | 1.5 | 28.0 | 54.0 | 0.5 | 0.0 | 0.5 | 23.2 | 28.4 | Opitz (1996), Table 3.8 |
| Priacanthidae | *Heteropriacanthus cruentatus* | 1.8 | 28.0 | 700.0 | 0.0 | 0.0 | 0.0 | 8.5 | 10.2 | Opitz (1996), Table 3.8 |
| | *Priacanthus arenatus* | 1.8 | 28.0 | 1653.0 | 0.0 | 0.0 | 0.0 | 7.2 | 8.6 | Opitz (1996), Table 3.8 |
| | *Priacanthus arenatus* | 1.9 | 27.9 | 767.4 | 0.0 | 0.0 | 0.0 | 8.6 | 10.1 | This study |
| Rachycentridae | *Rachycentron canadum* | 1.6 | 28.0 | 33400.0 | 0.0 | 0.0 | 0.0 | 3.6 | 4.4 | Opitz (1996), Table 3.8 |
| Scaridae | *Scarus coelestinus* | 1.1 | 28.0 | 8556.0 | 1.0 | 0.0 | 1.0 | 13.6 | 17.8 | Opitz (1996), Table 3.8 |
| | *Scarus coeruleus* | 1.5 | 28.0 | 3720.0 | 1.0 | 0.0 | 1.0 | 19.3 | 23.2 | Opitz (1996), Table 3.8 |
| | *Scarus guacamaia* | 1.2 | 28.0 | 23000.0 | 1.0 | 0.0 | 1.0 | 12.0 | 15.1 | Opitz (1996), Table 3.8 |
| | *Scarus iserti* | 1.4 | 28.0 | 141.0 | 1.0 | 0.0 | 1.0 | 36.9 | 44.9 | Opitz (1996), Table 3.8 |
| | *Scarus taeniopterus* | 1.1 | 28.0 | 1102.0 | 1.0 | 0.0 | 1.0 | 20.9 | 27.3 | Opitz (1996), Table 3.8 |
| | *Scarus vetula* | 1.1 | 28.0 | 5558.0 | 1.0 | 0.0 | 1.0 | 14.4 | 19.0 | Opitz (1996), Table 3.8 |
| | *Sparisoma aurofrenatum* | 1.3 | 28.0 | 324.0 | 1.0 | 0.0 | 1.0 | 29.6 | 36.6 | Opitz (1996), Table 3.8 |
| | *Sparisoma chrysopterum* | 1.4 | 28.0 | 1510.0 | 1.0 | 0.0 | 1.0 | 22.9 | 27.7 | Opitz (1996), Table 3.8 |
| | *Sparisoma radians* | 1.3 | 28.0 | 150.0 | 1.0 | 0.0 | 1.0 | 34.0 | 42.8 | Opitz (1996), Table 3.8 |
| | *Sparisoma rubripinne* | 1.5 | 28.0 | 2734.0 | 1.0 | 0.0 | 1.0 | 20.8 | 24.8 | Opitz (1996), Table 3.8 |
| | *Sparisoma rubripinne* | 0.9 | 26.4 | 535.0 | 1.0 | 0.0 | 1.0 | 21.7 | 28.6 | This study |
| | *Sparisoma viride* | 1.4 | 28.0 | 2430.0 | 1.0 | 0.0 | 1.0 | 20.7 | 25.1 | Opitz (1996), Table 3.8 |
| Sciaenidae | *Bairdiella chrysoura* | 1.9 | 26.0 | 178.0 | 0.0 | 0.0 | 0.0 | 11.0 | 12.4 | Vega-Cendejas et al. (1993), Table 4 |
| | *Ctenosciaena graciliirrhus* | 0.8 | 26.5 | 58.7 | 0.0 | 0.0 | 0.0 | 9.1 | 13.0 | This study |
| | *Cynoscion jamaicensis* | 1.1 | 26.7 | 267.4 | 0.0 | 0.0 | 0.0 | 7.7 | 10.1 | This study |
| | *Equetus lanceolatus* | 1.0 | 28.0 | 325.0 | 0.0 | 0.0 | 0.0 | 7.2 | 10.2 | Opitz (1996), Table 3.8 |
| | *Equetus punctatus* | 1.3 | 28.0 | 460.0 | 0.0 | 0.0 | 0.0 | 7.7 | 10.0 | Opitz (1996), Table 3.8 |
| | *Larimus breviceps* | 1.0 | 25.0 | 424.8 | 0.0 | 0.0 | 0.0 | 6.4 | 8.3 | This study |
| | *Menticirrhus americanus* | 1.4 | 27.0 | 226.7 | 0.0 | 0.0 | 0.0 | 9.1 | 11.3 | This study |
| | *Menticirrhus littoralis* | 1.1 | 24.2 | 383.7 | 0.0 | 0.0 | 0.0 | 6.7 | 8.3 | This study |
| | *Micropogonias furnieri* | 1.5 | 26.4 | 1027.4 | 0.0 | 0.0 | 0.0 | 6.8 | 8.2 | This study |
| | *Odontoscion dentex* | 1.7 | 28.0 | 318.0 | 0.0 | 0.0 | 0.0 | 9.6 | 11.7 | Opitz (1996), Table 3.8 |
| | *Pareques acuminatus* | 1.3 | 28.0 | 280.0 | 0.0 | 0.0 | 0.0 | 8.8 | 11.2 | Opitz (1996), Table 3.8 |
| | *Umbrina broussonnetii* | 1.3 | 27.0 | 236.7 | 0.0 | 0.0 | 0.0 | 8.8 | 11.0 | This study |
| | *Umbrina coroides* | 1.2 | 26.5 | 304.4 | 0.0 | 0.0 | 0.0 | 7.8 | 9.9 | This study |
| | *Umbrina millae* | 1.0 | 28.6 | 308.1 | 0.0 | 0.0 | 0.0 | 7.6 | 10.7 | This study |
| Scombridae | *Euthynnus aletteratus* | 6.3 | 28.0 | 12200.0 | 0.0 | 0.0 | 0.0 | 9.1 | 13.4 | Opitz (1996), Table 3.8 |
| | *Euthynnus aletteratus* | 5.8 | | | | | | | | Jarre et al. (1991), Table 2 |
| | *Scomberomorus cavalla* | 6.3 | 28.0 | 34285.0 | 0.0 | 0.0 | 0.0 | 7.4 | 10.9 | Opitz (1996), Table 3.8 |
| | *Scomberomorus cavalla* | 4.3 | 28.0 | | | | | | | This study |
| | *Scomberomorus brasiliensis* | 4.2 | 27.8 | 2220.9 | 0.0 | 0.0 | 0.0 | 10.4 | 12.7 | This study |
| | *Scomberomorus maculatus* | 4.9 | 28.0 | 4800.0 | 0.0 | 0.0 | 0.0 | 9.6 | 12.4 | Opitz (1996), Table 3.8 |
| | *Scomberomorus maculatus* | 3.4 | | | | | | | | Jarre et al. (1991), Table 2 |
| | *Scomberomorus regalis* | 6.2 | 28.0 | 4900.0 | 0.0 | 0.0 | 0.0 | 10.8 | 15.8 | Opitz (1996), Table 3.8 |
| | *Thunnus albacares* | 9.3 | 24.0 | 81920.0 | 0.0 | 0.0 | 0.0 | 6.9 | 13.1 | Palomares and Pauly (1989), Table 2 |
| Scorpaenidae | *Scorpaena brasiliensis* | 1.0 | 28.0 | 1600.0 | 0.0 | 0.0 | 0.0 | 5.4 | 7.4 | Opitz (1996), Table 3.8 |
| | *Scorpaena grandicornis* | 1.0 | 28.0 | 212.0 | 0.0 | 0.0 | 0.0 | 8.1 | 11.2 | Opitz (1996), Table 3.8 |
| | *Scopaena plumieri (s. plumieri plumieri\*)* | 1.0 | 28.0 | 4330.0 | 0.0 | 0.0 | 0.0 | 4.3 | 6.0 | Opitz (1996), Table 3.8 |
| | *Scorpaena plumieri (s. plumieri plumieri\*)* | 0.9 | 27.3 | 895.4 | 0.0 | 0.0 | 0.0 | 5.6 | 7.9 | This study |
| Serranidae | *Alphestes afer* | 1.2 | 28.0 | 1202.0 | 0.0 | 0.0 | 0.0 | 6.2 | 8.1 | Opitz (1996), Table 3.8 |
| | *Alphestes afer* | 0.9 | 28.0 | 203.5 | 0.0 | 0.0 | 0.0 | 7.8 | 11.1 | This study |
| | *Cephalopholis cruentata* | 1.2 | 28.0 | 691.0 | 0.0 | 0.0 | 0.0 | 7.0 | 9.2 | Opitz (1996), Table 3.8 |
| | *Cephalopholis fulva* | 1.5 | 28.0 | 640.0 | 0.0 | 0.0 | 0.0 | 7.8 | 9.7 | Opitz (1996), Table 3.8 |
| | *Dermatolepis inermis* | 1.5 | 28.0 | 10513.0 | 0.0 | 0.0 | 0.0 | 4.5 | 5.5 | Opitz (1996), Table 3.8 |

*Table 1. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. For symbols see text.* (continued)

| Family | Species | AR[a] | T(°C)[b] | W$_\infty$ (g) | h | d | HD | Q/B[c] | Q/B[d] | Source |
|---|---|---|---|---|---|---|---|---|---|---|
| | *Diplectrum formosum* | 1.5 | 28.0 | 550.0 | 0.0 | 0.0 | 0.0 | 8.1 | 10.1 | Opitz (1996), Table 3.8 |
| | *Epinephelus adscensionis* | 1.5 | 28.0 | 1981.0 | 0.0 | 0.0 | 0.0 | 6.3 | 7.8 | Opitz (1996), Table 3.8 |
| | *Epinephelus guttatus* | 1.0 | 28.0 | 2919.0 | 0.0 | 0.0 | 0.0 | 4.8 | 6.6 | Opitz (1996), Table 3.8 |
| | *Epinephelus guttatus* | 1.4 | 28.0 | 1880.0 | 0.0 | 0.0 | 0.0 | 6.2 | 7.8 | Palomares and Pauly (1989), Table 2 |
| | *Epinephelus itajara* | 1.3 | 28.0 | 381644.0 | 0.0 | 0.0 | 0.0 | 2.0 | 2.6 | Opitz (1996), Table 3.8 |
| | *Epinephelus itajara* | 1.1 | 28.0 | 814.0 | 0.0 | 0.0 | 0.0 | 6.4 | 8.6 | This study |
| | *Epinephelus morio* | 1.5 | 28.0 | 5010.0 | 0.0 | 0.0 | 0.0 | 5.1 | 6.4 | Opitz (1996), Table 3.8 |
| | *Epinephelus niveatus* | 1.5 | 23.9 | 244.2 | 0.0 | 0.0 | 0.0 | 8.8 | 9.8 | This study |
| | *Epinephelus striatus* | 1.6 | 28.0 | 23800.0 | 0.0 | 0.0 | 0.0 | 3.9 | 4.7 | Opitz (1996), Table 3.8 |
| | *Hypoplectrus aberrans* | 1.8 | 28.0 | 50.0 | 0.0 | 0.0 | 0.0 | 14.6 | 17.6 | Opitz (1996), Table 3.8 |
| | *Hypoplectrus chlorurus* | 1.5 | 28.0 | 64.0 | 0.0 | 0.0 | 0.0 | 12.7 | 15.8 | Opitz (1996), Table 3.8 |
| | *Hypoplectrus nigricans* | 1.8 | 28.0 | 90.0 | 0.0 | 0.0 | 0.0 | 12.7 | 15.4 | Opitz (1996), Table 3.8 |
| | *Hypoplectrus puella* | 1.6 | 28.0 | 64.0 | 0.0 | 0.0 | 0.0 | 12.9 | 15.9 | Opitz (1996), Table 3.8 |
| | *Mycteroperca bonaci* | 1.2 | 28.0 | 90000.0 | 0.0 | 0.0 | 0.0 | 2.6 | 3.4 | Opitz (1996), Table 3.8 |
| | *Mycteroperca cidi* | 1.1 | 28.0 | 77000.0 | 0.0 | 0.0 | 0.0 | 2.6 | 3.4 | Opitz (1996), Table 3.8 |
| | *Mycteroperca interstitialis* | 1.3 | 28.0 | 4000.0 | 0.0 | 0.0 | 0.0 | 5.0 | 6.5 | Opitz (1996), Table 3.8 |
| | *Mycteroperca phenax* | 1.4 | 28.0 | 43700.0 | 0.0 | 0.0 | 0.0 | 3.2 | 4.0 | Opitz (1996), Table 3.8 |
| | *Mycteroperca rubra* | 1.2 | 28.0 | 10719.0 | 0.0 | 0.0 | 0.0 | 4.0 | 5.2 | Opitz (1996), Table 3.8 |
| | *Mycteroperca tigris* | 1.8 | 28.0 | 17043.0 | 0.0 | 0.0 | 0.0 | 4.5 | 5.3 | Opitz (1996), Table 3.8 |
| | *Mycteroperca venenosa* | 1.1 | 28.0 | 12270.0 | 0.0 | 0.0 | 0.0 | 3.7 | 4.9 | Opitz (1996), Table 3.8 |
| | *Paranthias furcifer* | 2.3 | 28.0 | 1100.0 | 0.0 | 0.0 | 0.0 | 8.7 | 10.2 | Opitz (1996), Table 3.8 |
| | *Serranus atrobranchus* | 1.1 | 24.0 | 23.3 | 0.0 | 0.0 | 0.0 | 11.7 | 14.5 | This study |
| | *Serranus dewegeri* | 1.4 | 28.0 | 700.0 | 0.0 | 0.0 | 0.0 | 7.5 | 9.4 | Opitz (1996), Table 3.8 |
| | *Serranus tabacarius* | 1.2 | 28.0 | 141.0 | 0.0 | 0.0 | 0.0 | 9.7 | 12.7 | Opitz (1996), Table 3.8 |
| | *Serranus tigrinus* | 1.5 | 28.0 | 21.0 | 0.0 | 0.0 | 0.0 | 15.4 | 19.5 | Opitz (1996), Table 3.8 |
| | *Serranus tortugarum* | 1.6 | 28.0 | 12.0 | 0.0 | 0.0 | 0.0 | 18.0 | 22.4 | Opitz (1996), Table 3.8 |
| Sparidae | *Archosargus rhomboidalis* | 2.5 | 28.0 | 1200.0 | 0.8 | 0.0 | 0.8 | 25.5 | 28.7 | Opitz (1996), Table 3.8 |
| | *Archosargus rhomboidalis* | 2.8 | 26.0 | 366.0 | 0.5 | 0.0 | 0.5 | 21.9 | 23.6 | Vega-Cendejas et al. (1993), Table 4 |
| | *Archosargus probatocephalus* | 2.3 | | | | | | | | Jarre et al. (1991), Table 2 |
| | *Calamus bajonado* | 3.0 | 28.0 | 4500.0 | 0.0 | 0.0 | 0.0 | 7.6 | 8.8 | Opitz (1996), Table 3.8 |
| | *Calamus calamus* | 3.2 | 28.0 | 1541.0 | 0.0 | 0.0 | 0.0 | 9.7 | 11.3 | Opitz (1996), Table 3.8 |
| | *Calamus penna* | 3.1 | 28.0 | 2000.0 | 0.0 | 0.0 | 0.0 | 9.1 | 10.6 | Opitz (1996), Table 3.8 |
| | *Calamus penna* | 2.9 | 26.9 | 1537.6 | 0.0 | 0.0 | 0.0 | 9.1 | 10.2 | This study |
| | *Calamus pennatula* | 3.0 | 28.0 | 1700.0 | 0.0 | 0.0 | 0.0 | 9.3 | 10.8 | Opitz (1996), Table 3.8 |
| | *Calamus pennatula* | 2.5 | 25.7 | 1459.3 | 0.0 | 0.0 | 0.0 | 8.3 | 9.0 | This study |
| | *Diplodus caudimacula (D. argenteus caudimacula\*)* | 2.9 | 28.0 | 600.0 | 0.8 | 0.0 | 0.8 | 30.8 | 34.7 | Opitz (1996), Table 3.8 |
| | *Lagodon rhomboides* | 2.5 | 26.0 | 167.0 | 0.0 | 0.0 | 0.0 | 12.7 | 14.0 | Vega-Cendejas et al. (1993), Table 4 |
| | *Pagrus pagrus* | 1.8 | 28.0 | 697.7 | 0.0 | 0.0 | 0.0 | 8.5 | 10.2 | This study |
| Sphyraenidae | *Sphyraena barracuda* | 1.6 | 28.0 | 57800.0 | 0.0 | 0.0 | 0.0 | 3.3 | 4.0 | Opitz (1996), Table 3.8 |
| | *Sphyraena guachancho* | 2.0 | 26.5 | 790.0 | 0.0 | 0.0 | 0.0 | 8.4 | 9.5 | This study |
| | *Sphyraena picudilla* | 2.6 | 28.0 | 1300.0 | 0.0 | 0.0 | 0.0 | 9.1 | 10.5 | Opitz (1996), Table 3.8 |
| | *Sphyraena picudilla* | 2.0 | 27.7 | 389.5 | 0.0 | 0.0 | 0.0 | 9.9 | 11.6 | This study |
| Stromateidae | *Peprilus alepidotus* | 2.6 | | | | | | | | Jarre et al. (1991), Table 2 |
| Synodontidae | *Saurida brasiliensis* | 2.1 | 24.0 | 116.3 | 0.0 | 0.0 | 0.0 | 12.0 | 12.7 | This study |
| | *Saurida normani* | 2.3 | 25.7 | 255.8 | 0.0 | 0.0 | 0.0 | 11.2 | 12.3 | This study |
| | *Synodus intermedius* | 2.4 | 28.0 | 1103.0 | 0.0 | 0.0 | 0.0 | 8.9 | 10.4 | Opitz (1996), Table 3.8 |
| | *Synodus foetens* | 2.7 | 28.0 | 1100.0 | 0.0 | 0.0 | 0.0 | 9.5 | 10.9 | Opitz (1996), Table 3.8 |
| | *Synodus foetens* | 2.1 | 25.7 | 232.6 | 0.0 | 0.0 | 0.0 | 10.8 | 11.9 | This study |
| | *Synodus poeyi* | 1.5 | 24.0 | 17.4 | 0.0 | 0.0 | 0.0 | 14.9 | 16.7 | This study |
| | *Synodus synodus* | 2.4 | 28.0 | 400.0 | 0.0 | 0.0 | 0.0 | 11.0 | 12.8 | Opitz (1996), Table 3.8 |
| Tetraodontidae | *Canthigaster rostrata* | 1.5 | 28.0 | 82.0 | 0.2 | 0.0 | 0.2 | 15.1 | 18.6 | Opitz (1996), Table 3.8 |
| | *Sphoeroides spengleri* | 1.6 | 28.0 | 92.0 | 0.1 | 0.0 | 0.1 | 13.2 | 16.3 | Opitz (1996), Table 3.8 |
| | *Lagocephalus laevigatus* | 1.9 | 27.8 | 1540.7 | 0.0 | 0.0 | 0.0 | 7.5 | 8.8 | This study |
| Triglidae | *Prionotus punctatus* | 0.9 | 26.5 | 325.6 | 0.0 | 0.0 | 0.0 | 6.7 | 9.3 | This study |
| | *Prionotus stearnsi* | 1.2 | 24.0 | 232.6 | 0.0 | 0.0 | 0.0 | 7.9 | 9.3 | This study |

*Table 2. Estimated Q/B ratio of Caribbean fishes and associated estimates of Q/B-predictor parameters. Aspect ratios from Opitz (1996) are assumed values.*

| Family | Species | AR[a] | T(°C)[b] | W∞ (g) | h | d | HD | Q/B[c] | Q/B[d] | Q/B[e] | Source |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carcharhinidae | *Carcharhinus acronotus* | 7.0 | 28.0 | 90000.0 | 0.0 | 0.0 | 0.0 | 6.4 | 10.2 | | Opitz (1996), Table 3.8 |
| | *Carcharhinus falciformis* | 7.0 | 28.0 | 350000.0 | 0.0 | 0.0 | 0.0 | 4.9 | 7.7 | | Opitz (1996), Table 3.8 |
| | *Carcharhinus leucas* | 7.0 | 28.0 | 350000.0 | 0.0 | 0.0 | 0.0 | 4.9 | 7.7 | | Opitz (1996), Table 3.8 |
| | *Carcharhinus limbatus* | 7.0 | 28.0 | 116000.0 | 0.0 | 0.0 | 0.0 | 6.1 | 9.7 | | Opitz (1996), Table 3.8 |
| | *Carcharhinus longimanus* | 7.0 | 28.0 | 350000.0 | 0.0 | 0.0 | 0.0 | 4.9 | 7.7 | | Opitz (1996), Table 3.8 |
| | *Carcharhinus perezi* | 7.0 | 28.0 | 100000.0 | 0.0 | 0.0 | 0.0 | 6.3 | 10.0 | | Opitz (1996), Table 3.8 |
| | *Galeocerdo cuvier* | 7.0 | 28.0 | 672000.0 | 0.0 | 0.0 | 0.0 | 4.3 | 6.8 | | Opitz (1996), Table 3.8 |
| | *Negaprion brevirostris* | 7.0 | 28.0 | 110000.0 | 0.0 | 0.0 | 0.0 | 6.2 | 9.8 | | Opitz (1996), Table 3.8 |
| | *Rhizoprionodon porosus* | 7.0 | 28.0 | 5020.0 | 0.0 | 0.0 | 0.0 | 11.5 | 18.4 | | Opitz (1996), Table 3.8 |
| Dasyatidae | *Dasyatis americana* | 7.0 | 28.0 | 122000.0 | 0.0 | 0.0 | 0.0 | 6.0 | 9.6 | | Opitz (1996), Table 3.8 |
| | *Dasyatis americana* | | 26.3 | 12236.0 | | | 0.0 | | | 6.3 | This study |
| | *Dasyatis guttata* | | 25.6 | 13953.0 | | | 0.0 | | | 6.0 | This study |
| Ginglymostomatidae | *Ginglymostoma cirratum* | 7.0 | 28.0 | 500000.0 | 0.0 | 0.0 | 0.0 | 4.5 | 7.2 | | Opitz (1996), Table 3.8 |
| Muraenidae | *Enchelycore nigricans* | 0.7 | 28.0 | 900.0 | 0.0 | 0.0 | 0.0 | 5.0 | 7.8 | | Opitz (1996), Table 3.8 |
| | *Echidna catenata* | 0.7 | 28.0 | 600.0 | 0.0 | 0.0 | 0.0 | 5.4 | 8.5 | | Opitz (1996), Table 3.8 |
| | *Gymnothorax funebris* | 0.7 | 28.0 | 12000.0 | 0.0 | 0.0 | 0.0 | 2.9 | 4.6 | | Opitz (1996), Table 3.8 |
| | *Gymnothorax milliaris* | 0.7 | 28.0 | 201.0 | 0.0 | 0.0 | 0.0 | 6.7 | 10.6 | | Opitz (1996), Table 3.8 |
| | *Gymnothorax vicinus* | 0.7 | 28.0 | 3000.0 | 0.0 | 0.0 | 0.0 | 3.9 | 6.1 | | Opitz (1996), Table 3.8 |
| | *Lycodontis moringa* | 0.7 | 28.0 | 950.0 | 0.0 | 0.0 | 0.0 | 4.9 | 7.8 | | Opitz (1996), Table 3.8 |
| Myliobatidae | *Aetobatus narinari* | 7.0 | 28.0 | 230000.0 | 0.0 | 0.0 | 0.0 | 5.3 | 8.4 | | Opitz (1996), Table 3.8 |
| Ophictidae | *Myrichthys breviceps* | 0.7 | 28.0 | 640.0 | 0.0 | 0.0 | 0.0 | 5.3 | 8.4 | | Opitz (1996), Table 3.8 |
| | *Myrichthys ocellatus* | 0.7 | 28.0 | 640.0 | 0.0 | 0.0 | 0.0 | 5.3 | 8.4 | | Opitz (1996), Table 3.8 |
| | *Ophichthus ophis* | 0.7 | 28.0 | 2091.0 | 0.0 | 0.0 | 0.0 | 4.2 | 6.6 | | Opitz (1996), Table 3.8 |
| Rhinobatidae | *Rhinobatos percellens* | | 27.6 | 825.0 | | | 0.0 | | | 10.4 | This study |
| Trichiuridae | *Trichiurus lepturus* | | 26.1 | 1188.0 | | | 0.0 | | | 9.2 | This study |
| Sphyrnidae | *Sphyrna lewini* | 7.0 | 28.0 | 400853.0 | 0.0 | 0.0 | 0.0 | 4.7 | 7.5 | | Opitz (1996), Table 3.8 |
| | *Sphyrna tiburo* | 7.0 | 28.0 | 18000.0 | 0.0 | 0.0 | 0.0 | 8.9 | 14.2 | | Opitz (1996), Table 3.8 |
| Torpedinidae | *Narcine brasiliensis* | | 26.8 | 1590.0 | | | 0.0 | | | 9.0 | This study |
| Triakidae | *Mustelus canis* | 7.0 | 28.0 | 15000.0 | 0.0 | 0.0 | 0.0 | 9.2 | 14.7 | | Opitz (1996), Table 3.8 |

Note:
[a] Aspect ratio
[b] Mean habitat temperature
[c] Using Palomares & Pauly 1989 equation
[d] Using Palomares & Pauly 1998 equation
[e] Using Pauly et al. 1990 equation

**Table 3. Ranking of Caribbean fish families according to mean Q/B-predictor parameters and mean Q/B values.**
Q/B1989=based on Palomares and Pauly (1989); Q/B1998= based on Palomares and Pauly (1998); * = based on Pauly et al. (1990). For symbols see text.

| Family | Aspect ratio | Family | W$_\infty$ (g) | Family | HD | Family | Q/B 1989 | Family | Q/B 1998 |
|---|---|---|---|---|---|---|---|---|---|
| Scombridae | 5.6 | Ginglymostomatidae | 500000.0 | Engraulidae | 1.0 | Engraulidae | 73.3 | Engraulidae | 85.8 |
| Albulidae | 4.7 | Carcharhinidae | 238113.3 | Kyphosidae | 1.0 | Blenniidae | 38.3 | Blenniidae | 50.8 |
| Elopidae | 4.1 | Myliobatidae | 230000.0 | Mugilidae | 1.0 | Acanthuridae | 29.7 | Gobiidae | 39.4 |
| Carangidae | 3.9 | Sphyrnidae | 209426.5 | Scaridae | 1.0 | Mugilidae | 29.5 | Acanthuridae | 33.5 |
| Hemiramphidae | 3.0 | Coryphaenidae | 147000.0 | Acanthuridae | 0.9 | Gobiidae | 28.0 | Mugilidae | 32.6 |
| Emmelichthyidae | 2.9 | Megalopidae | 80532.0 | Blenniidae | 0.8 | Hemiramphidae | 24.3 | Scaridae | 27.7 |
| Ephippidae | 2.9 | Dasyatidae | 49396.3 | Hemiramphidae | 0.4 | Kyphosidae | 23.6 | Hemiramphidae | 27.7 |
| Megalopidae | 2.9 | Rachycentridae | 33400.0 | Monacanthidae | 0.4 | Scaridae | 22.2 | Kyphosidae | 26.2 |
| Kyphosidae | 2.9 | Scombridae | 23387.7 | Gobiidae | 0.4 | Apogonidae | 19.3 | Apogonidae | 23.8 |
| Coryphaenidae | 2.9 | Serranidae | 22228.7 | Pomacentridae | 0.4 | Atherinidae | 18.9 | Atherinidae | 22.9 |
| Sparidae | 2.7 | Sphyraenidae | 15069.9 | Pomacanthidae | 0.3 | Pomacentridae | 18.5 | Pomacentridae | 22.1 |
| Gerreidae | 2.7 | Triakidae | 15000.0 | Balistidae | 0.3 | Cirrhitidae | 16.9 | Cirrhitidae | 21.1 |
| Haemulidae | 2.5 | Diodontidae | 8042.9 | Sparidae | 0.2 | Pomacanthidae | 14.8 | Callionymidae | 20.5 |
| Holocentridae | 2.4 | Kyphosidae | 7630.5 | Ostraciidae | 0.2 | Myctophidae | 14.8 | Myctophidae | 19.7 |
| Clupeidae | 2.4 | Lutjanidae | 7241.2 | Ogcocephalidae | 0.1 | Callionymidae | 14.7 | Grammidae | 18.7 |
| Pempheridae | 2.3 | Carangidae | 6435.7 | Ephippidae | 0.1 | Pempheridae | 14.2 | Pomacanthidae | 17.6 |
| Chaetodontidae | 2.2 | Ephippidae | 5103.6 | Tetraodontidae | 0.1 | Grammidae | 14.2 | Pempheridae | 16.6 |
| Belonidae | 2.2 | Scaridae | 4146.7 | Clupeidae | 0.0 | Chaetodontidae | 14.2 | Chaetodontidae | 16.6 |
| Synodontidae | 2.2 | Fistulariidae | 3931.4 | Achiridae | 0.0 | Sparidae | 13.9 | Albulidae | 16.6 |
| Balistidae | 2.1 | Pomacanthidae | 3210.7 | Albulidae | 0.0 | Gerreidae | 13.6 | Elopidae | 16.0 |
| Mullidae | 2.0 | Muraenidae | 2941.8 | Antennariidae | 0.0 | Albulidae | 13.2 | Monacanthidae | 16.0 |
| Acanthuridae | 2.0 | Balistidae | 2100.8 | Apogonidae | 0.0 | Emmelichthyidae | 13.1 | Sparidae | 15.6 |
| Sphyraenidae | 2.0 | Ostraciidae | 2004.8 | Ariidae | 0.0 | Clupeidae | 13.1 | Gerreidae | 15.4 |
| Ariidae | 2.0 | Scorpaenidae | 1759.3 | Atherinidae | 0.0 | Elopidae | 13.1 | Emmelichthyidae | 15.2 |
| Mugilidae | 2.0 | Torpedinidae | 1590.0 | Aulostomidae | 0.0 | Holocentridae | 12.5 | Clupeidae | 15.0 |
| Pomacanthidae | 1.9 | Bothidae | 1590.0 | Batrachoididae | 0.0 | Balistidae | 12.2 | Opistognathidae | 14.8 |
| Priacanthidae | 1.8 | Mugilidae | 1583.5 | Belonidae | 0.0 | Monacanthidae | 12.1 | Triakidae | 14.7 |
| Pomacentridae | 1.8 | Echeneidae | 1550.7 | Bothidae | 0.0 | Tetraodontidae | 11.9 | Tetraodontidae | 14.6 |
| Polynemidae | 1.8 | Sparidae | 1433.5 | Callionymidae | 0.0 | Achiridae | 11.6 | Holocentridae | 14.4 |
| Atherinidae | 1.8 | Monacanthidae | 1374.6 | Carangidae | 0.0 | Belonidae | 11.6 | Achiridae | 14.2 |
| Engraulidae | 1.8 | Labridae | 1280.0 | Carcharhinidae | 0.0 | Synodontidae | 11.2 | Balistidae | 14.0 |
| Lutjanidae | 1.7 | Trichiuridae | 1188.0 | Chaetodontidae | 0.0 | Mullidae | 10.5 | Antennariidae | 14.0 |
| Aulostomidae | 1.7 | Ophictidae | 1123.7 | Cirrhitidae | 0.0 | Rhinobathidae | 10.4* | Belonidae | 13.7 |
| Tetraodontidae | 1.7 | Priacanthidae | 1040.1 | Clinidae | 0.0 | Carangidae | 10.3 | Scombridae | 13.0 |
| Apogonidae | 1.6 | Dactylopteridae | 982.3 | Coryphaenidae | 0.0 | Polynemidae | 10.0 | Paralichthyidae | 13.0 |
| Dactylopteridae | 1.6 | Haemulidae | 955.4 | Dactylopteridae | 0.0 | Opistognathidae | 10.0 | Batrachoididae | 12.9 |
| Rachycentridae | 1.6 | Albulidae | 854.7 | Dasyatidae | 0.0 | Antennariidae | 10.0 | Clinidae | 12.9 |
| Cirrhitidae | 1.5 | Rhinobatidae | 825.0 | Diodontidae | 0.0 | Haemulidae | 10.0 | Synodontidae | 12.5 |
| Achiridae | 1.5 | Malacanthidae | 807.2 | Echeneidae | 0.0 | Clinidae | 9.9 | Carangidae | 12.3 |
| Malacanthidae | 1.5 | Aulostomidae | 777.0 | Elopidae | 0.0 | Ariidae | 9.6 | Mullidae | 12.0 |
| Fistulariidae | 1.4 | Acanthuridae | 697.3 | Emmelichthyidae | 0.0 | Paralichthyidae | 9.6 | Labridae | 11.6 |
| Ostraciidae | 1.4 | Elopidae | 687.1 | Fistulariidae | 0.0 | Trichiuridae | 9.2* | Polynemidae | 11.6 |
| Serranidae | 1.4 | Grammistidae | 685.0 | Gerreidae | 0.0 | Triakidae | 9.2 | Haemulidae | 11.5 |
| Labridae | 1.4 | Tetraodontidae | 571.6 | Ginglymostomatidae | 0.0 | Labridae | 9.1 | Sphyrnidae | 10.9 |
| Grammistidae | 1.4 | Synodontidae | 460.7 | Grammidae | 0.0 | Scombridae | 9.0 | Ostraciidae | 10.8 |
| Bothidae | 1.3 | Ariidae | 456.1 | Grammistidae | 0.0 | Torpedinidae | 9.0* | Ariidae | 10.8 |
| Clinidae | 1.3 | Hemiramphidae | 456.0 | Haemulidae | 0.0 | Ephippidae | 8.9 | Sciaenidae | 10.4 |
| Diodontidae | 1.3 | Belonidae | 440.0 | Holocentridae | 0.0 | Ostraciidae | 8.8 | Rhinobatidae | 10.4* |
| Scaridae | 1.3 | Ogcocephalidae | 348.8 | Labridae | 0.0 | Dactylopteridae | 8.6 | Ephippidae | 10.1 |
| Sciaenidae | 1.2 | Sciaenidae | 342.8 | Lutjanidae | 0.0 | Sciaenidae | 8.2 | Dactylopteridae | 10.1 |
| Grammidae | 1.2 | Mullidae | 328.9 | Malacanthidae | 0.0 | Priacanthidae | 8.1 | Carcharhinidae | 9.8 |
| Echeneidae | 1.2 | Holocentridae | 321.4 | Megalopidae | 0.0 | Aulostomidae | 8.1 | Aulostomidae | 9.8 |
| Monacanthidae | 1.2 | Gerridae | 307.7 | Mullidae | 0.0 | Batrachoididae | 8.0 | Bothidae | 9.7 |
| Blenniidae | 1.1 | Pomacentridae | 285.2 | Muraenidae | 0.0 | Malacanthidae | 7.7 | Ogcocephalidae | 9.7 |
| Triglidae | 1.1 | Emmelichthyidae | 282.0 | Myctophidae | 0.0 | Sphyraenidae | 7.7 | Priacanthidae | 9.6 |
| Antennariidae | 1.0 | Triglidae | 279.1 | Myliobatidae | 0.0 | Bothidae | 7.6 | Dasyatidae | 9.6 |
| Scorpaenidae | 1.0 | Polynemidae | 273.3 | Ophichthidae | 0.0 | Serranidae | 7.6 | Malacanthidae | 9.6 |
| Paralichthyidae | 1.0 | Clupeidae | 264.6 | Opistognathidae | 0.0 | Grammistidae | 7.4 | Serranidae | 9.5 |
| Myctophidae | 1.0 | Clinidae | 137.0 | Paralichthyidae | 0.0 | Triglidae | 7.3 | Grammistidae | 9.4 |
| Gobiidae | 1.0 | Chaetodontidae | 112.9 | Pempheridae | 0.0 | Sphyrnidae | 6.8 | Triglidae | 9.3 |
| Opistognathidae | 0.9 | Pempheridae | 100.0 | Polynemidae | 0.0 | Lutjanidae | 6.7 | Trichiuridae | 9.2* |
| Callionymidae | 0.6 | Opistognathidae | 87.5 | Priacanthidae | 0.0 | Megalopidae | 6.7 | Torpedinidae | 9.0* |
| Ogcocephalidae | 0.5 | Achiridae | 87.2 | Rachycentridae | 0.0 | Fistulariidae | 6.6 | Sphyraenidae | 8.9 |
| Batrachoididae | 0.5 | Paralichthyidae | 84.3 | Rhinobatidae | 0.0 | Echeneidae | 6.3 | Myliobatidae | 8.4 |
| | | Antennariidae | 70.0 | Sciaenidae | 0.0 | Carcharhinidae | 6.2 | Fistulariidae | 8.3 |
| | | Batrachoididae | 23.8 | Scombridae | 0.0 | Dasyatidae | 6.1* | Scorpaenidae | 8.1 |
| | | Grammidae | 22.5 | Scorpaenidae | 0.0 | Dasyatidae | 6.0 | Lutjanidae | 8.1 |
| | | Blenniidae | 21.3 | Serranidae | 0.0 | Scorpaenidae | 5.9 | Echeneidae | 7.9 |
| | | Apogonidae | 20.2 | Sphyraenidae | 0.0 | Ogcocephalidae | 5.8 | Ophichthidae | 7.8 |
| | | Cirrhitidae | 15.0 | Sphyrnidae | 0.0 | Diodontidae | 5.4 | Megalopidae | 7.6 |
| | | Atherinidae | 13.5 | Synodontidae | 0.0 | Myliobatidae | 5.3 | Muraenidae | 7.6 |
| | | Engraulidae | 8.0 | Torpedinidae | 0.0 | Ophichthidae | 4.9 | Ginglymostomatidae | 7.2 |
| | | Myctophidae | 5.7 | Triakidae | 0.0 | Muraenidae | 4.8 | Diodontidae | 6.7 |
| | | Gobiidae | 5.6 | Trichiuridae | 0.0 | Ginglymostomatidae | 4.5 | Dasyatidae | 6.1* |
| | | Callionymidae | 1.0 | Triglidae | 0.0 | Coryphaenidae | 3.7 | Rachycentridae | 4.4 |
| | | | | | | Rachycentridae | 3.6 | Coryphaenidae | 3.9 |