

Length-weight relationships of marine fish collected from around the British Isles

J. F. Silva, J. R. Ellis and R. A. Ayers

Length-weight relationships of marine fish collected from around the British Isles

J. F. Silva, J. R. Ellis and R. A. Ayers

This report should be cited as: Silva J. F., Ellis J. R. and Ayers R. A. 2013. Length-weight relationships of marine fish collected from around the British Isles. Sci. Ser. Tech. Rep., Cefas Lowestoft, 150: 109pp.

Additional copies can be obtained from Cefas by e-mailing a request to lowlibrary@cefas.co.uk or downloading from the Cefas website www.cefas.defra.gov.uk.

© Crown copyright, 2013

This publication (excluding the logos) may be re-used free of charge in any format or medium for research for non-commercial purposes, private study or for internal circulation within an organisation. This is subject to it being re-used accurately and not used in a misleading context. The material must be acknowledged as Crown copyright and the title of the publication specified.

This publication is also available at www.cefas.defra.gov.uk

For any other use of this material please apply for a Click-Use Licence for core material at www.hms0.gov.uk/copyright/licences/core/core_licence.htm, or by writing to:

HMSO's Licensing Division
St Clements House
2-16 Colegate
Norwich
NR3 1BQ
Fax: 01603 723000
E-mail: licensing@cabinet-office.x.gsi.gov.uk

Contents

1.	Introduction	5
-----------	---------------------	----------

2.	Methods	6
2.1	Surveys used	6
2.2	Measurements	6
2.3	Electronic data collection	6
2.4	Data quality	6
2.5	Data analysis	8

3.	Results and Discussion	10
-----------	-------------------------------	-----------

	Acknowledgments	45
--	------------------------	-----------

	References	46
--	-------------------	-----------

	Annex 1: Cefas Research Vessel Electronic Data Capture system (RV EDC) – A description	51
--	---	-----------

	Annex 2: Length-weight relationships for species collected from around the British Isles (2009–2012)	52
--	---	-----------

Figures

Figure 1	Main survey fishing stations where length-weight data were collected during 2009–2012.	7	Figure 56	<i>Eutrigla gurnardus</i> Grey gurnard	82
Figure 2	Length-weight relationship for sprat <i>Sprattus sprattus</i> collected with two different protocols.	12	Figure 57	<i>Myoxocephalus scorpius</i> Bullrout	83
Figure 3	<i>Myxine glutinosa</i> Hagfish	52	Figure 58	<i>Taurulus bubalis</i> Sea scorpion	83
Figure 4	<i>Squalus acanthias</i> Spurdog	52	Figure 59	<i>Cyclopterus lumpus</i> Lump sucker	83
Figure 5	<i>Galeus melastomus</i> Black-mouth dogfish	52	Figure 60	<i>Liparis</i> spp. Sea snail	83
Figure 6	<i>Scyliorhinus stellaris</i> Greater-spotted dogfish	52	Figure 61	<i>Agonus cataphractus</i> Pogge	84
Figure 7	<i>Scyliorhinus canicula</i> Lesser-spotted dogfish	53	Figure 62	<i>Dicentrarchus labrax</i> European seabass	85
Figure 8	<i>Mustelus</i> spp. Smooth-hound	54	Figure 63	<i>Spondyllosoma cantharus</i> Black sea bream	85
Figure 9	<i>Galeorhinus galeus</i> Tope	55	Figure 64	<i>Mullus surmuletus</i> Red mullet	85
Figure 10	<i>Torpedo marmorata</i> Marbled electric ray	55	Figure 65	<i>Cepola rubescens</i> Red bandfish	85
Figure 11	<i>Amblyraja radiata</i> Starry ray	55	Figure 66	<i>Trachurus trachurus</i> Horse mackerel	86
Figure 12	<i>Dipturus batis</i> -complex Common skate	55	Figure 67	<i>Ctenolabrus rupestris</i> Goldsinny	87
Figure 13	<i>Leucoraja naevus</i> Cuckoo ray	56	Figure 68	<i>Labrus mixtus</i> Cuckoo wrasse	87
Figure 14	<i>Raja brachyura</i> Blonde ray	57	Figure 69	<i>Symphodus balloni</i> Bailon's wrasse	87
Figure 15	<i>Raja clavata</i> Thornback ray	58	Figure 70	<i>Labrus bergylta</i> Ballan wrasse	87
Figure 16	<i>Raja montagui</i> Spotted ray	59	Figure 71	<i>Ammodytes</i> spp. Sandeel	88
Figure 17	<i>Leucoraja fullonica</i> Shagreen ray	60	Figure 72	<i>Gymnammodytes semisquamatus</i> Smooth sandeel	88
Figure 18	<i>Raja microocellata</i> Small-eyed ray	60	Figure 73	<i>Hyperoplus lanceolatus</i> Greater sandeel	88
Figure 19	<i>Raja undulata</i> Undulate ray	60	Figure 74	<i>Hyperoplus immaculatus</i> Corbin's sandeel	88
Figure 20	<i>Conger conger</i> European conger eel	60	Figure 75	<i>Echiichthys vipera</i> Lesser weever	89
Figure 21	<i>Clupea harengus</i> Herring	61	Figure 76	<i>Trachinus draco</i> Greater weever	90
Figure 22	<i>Sprattus sprattus</i> Sprat	62	Figure 77	<i>Blennius ocellaris</i> Butterfly blenny	90
Figure 23	<i>Sardina pilchardus</i> Pilchard	63	Figure 78	<i>Parablennius gattorugine</i> Tompot blenny	90
Figure 24	<i>Engraulis encrasicolus</i> European anchovy	63	Figure 79	<i>Lumpenus lampretaeformis</i> Snake blenny	90
Figure 25	<i>Mauroliscus muelleri</i> Pearlsides	63	Figure 80	<i>Pholis gunnellus</i> Butterfish	91
Figure 26	<i>Argentina</i> spp. Argentine	64	Figure 81	<i>Anarhichas lupus</i> Wolf-fish	91
Figure 27	<i>Gadiculus argenteus</i> Silvery pout	65	Figure 82	<i>Callionymus reticulatus</i> Reticulate dragonet	91
Figure 28	<i>Gadus morhua</i> Cod	66	Figure 83	<i>Buena jeffreysii</i> Jeffrey's goby	91
Figure 29	<i>Melanogrammus aeglefinus</i> Haddock	67	Figure 84	<i>Callionymus lyra</i> Common dragonet	92
Figure 30	<i>Merlangius merlangus</i> Whiting	68	Figure 85	<i>Callionymus maculatus</i> Spotted dragonet	93
Figure 31	<i>Micromesistius poutassou</i> Blue whiting	69	Figure 86	<i>Gobius gasteveni</i> Steven's goby	94
Figure 32	<i>Pollachius pollachius</i> Pollack	70	Figure 87	<i>Gobius niger</i> Black goby	94
Figure 33	<i>Pollachius virens</i> Saithe	70	Figure 88	<i>Gobius paganellus</i> Rock goby	94
Figure 34	<i>Ciliata mustela</i> Five-bearded rockling	70	Figure 89	<i>Lesueurigobius friesii</i> Fries's goby	94
Figure 35	<i>Ciliata septentrionalis</i> Northern rockling	70	Figure 90	<i>Scomber scombrus</i> European mackerel	95
Figure 36	<i>Triptopterus esmarki</i> Norway pout	71	Figure 91	<i>Lepidorhombus whiffiagonis</i> Megrim	96
Figure 37	<i>Triptopterus luscus</i> Bib	72	Figure 92	<i>Pomatoschistus</i> spp. Sand goby	97
Figure 38	<i>Trisopterus minutus</i> Poor cod	73	Figure 93	<i>Lepidorhombus boscii</i> Four-spot megrim	97
Figure 39	<i>Enchelyopus cimbrius</i> Four-bearded rockling	74	Figure 94	<i>Scophthalmus maximus</i> Turbot	97
Figure 40	<i>Gaidropsarus mediterraneus</i> Shore rockling	74	Figure 95	<i>Zeugopterus punctatus</i> Topknot	97
Figure 41	<i>Gaidropsarus vulgaris</i> Three-bearded rockling	74	Figure 96	<i>Scophthalmus rhombus</i> Brill	98
Figure 42	<i>Molva molva</i> Ling	74	Figure 97	<i>Phrynorhombus norvegicus</i> Norwegian topknot	99
Figure 43	<i>Merluccius merluccius</i> European hake	75	Figure 99	<i>Arnoglossus imperialis</i> Imperial scaldfish	99
Figure 44	<i>Lophius piscatorius</i> Anglerfish	76	Figure 98	<i>Phrynorhombus regius</i> Ekström's topknot	99
Figure 45	<i>Phycis blennoides</i> Greater forkbeard	77	Figure 100	<i>Platichthys flesus</i> Flounder	99
Figure 46	<i>Lophius budegassa</i> Black-bellied anglerfish	77	Figure 101	<i>Arnoglossus laterna</i> Scaldfish	100
Figure 47	<i>Diplecogaster bimaculata</i> Two-spotted clingfish	77	Figure 102	<i>Pleuronectes platessa</i> European plaice	101
Figure 48	<i>Zeus faber</i> John dory	77	Figure 103	<i>Limanda limanda</i> Dab	102
Figure 49	<i>Capros aper</i> Boarfish	78	Figure 104	<i>Microstomus kitt</i> Lemon sole	103
Figure 50	<i>Entelurus aequoreus</i> Snake pipefish	79	Figure 105	<i>Glyptocephalus cynoglossus</i> Witch	104
Figure 51	<i>Syngnathus</i> spp. Pipefish	79	Figure 106	<i>Hippoglossoides platessoides</i> Long-rough dab	105
Figure 52	<i>Sebastes</i> spp. Redfish	79	Figure 107	<i>Hippoglossus hippoglossus</i> Halibut	106
Figure 53	<i>Trigloporus lastoviza</i> Streaked gurnard	79	Figure 108	<i>Pegusa lascaris</i> Sand sole	106
Figure 54	<i>Aspitrigla cuculus</i> Red gurnard	80	Figure 109	<i>Solea solea</i> Sole	107
Figure 55	<i>Trigla lucerna</i> Tub gurnard	81	Figure 110	<i>Buglossidium luteum</i> Solenette	108
			Figure 111	<i>Microchirus variegatus</i> Thickback sole	109

1. Introduction

Length-weight relationships are of great value in fisheries research, as they are essential to convert length-frequency data into accurate biomass estimates and are so often used in stock assessment methods. For example, market sampling data and observer data from commercial fishing vessels, such as discard studies (Enever *et al.*, 2007), where individual fish weights may not be collected require such conversion factors. They are also of use for recreational fishing, so as to inform on likely weights of specimen fish that may be measured and released alive (Kohler *et al.*, 1995). Furthermore, such data are useful for data checking and quality assurance for fisheries-independent survey data, as the estimated catch weight from the length-frequency data can be compared to recorded species catch weights.

Although length-weight conversion factors are of fundamental importance in fisheries science, recent data from the seas of northern Europe are generally lacking, with the works of Bedford *et al.* (1986), Dorel (1986) and Coull *et al.* (1989) providing the most up to date data for a variety of marine fish around the British Isles. More recently, Robinson *et al.* (2010) provided data for a range of (mostly smaller) fish and invertebrates from the North Sea, and McCully *et al.* (2012) reported on length-weight relationships for skates (Rajidae).

In contrast, there have been a plethora of recent studies in southern Europe and the Mediterranean Sea, providing length-weight conversion factors for fish species taken around Portugal (Gonçalves *et al.*, 1997; Santos *et al.*, 2002; Borges *et al.*, 2003; Mendes *et al.*, 2004; Olim & Borges, 2006; Veiga *et al.*, 2009), including the Azores (Morato *et al.*, 2001; Rosa *et al.*, 2006) and Madeira (Ferreira *et al.*, 2008); Spain (including the Balearic Islands) (Merella *et al.*, 1997; Morey *et al.*, 2003; Valle *et al.*, 2003; Verdiell-Cubedo *et al.*, 2006; Mata *et al.*, 2008; Torres *et al.*, 2012); Sicily (Giacalone *et al.*, 2010); Adriatic Sea (Dulčić & Kraljević, 1996, 1997; Pallaoro *et al.*, 2005; Dulčić & Glamuzina, 2006; Vallisneri *et al.*, 2010); Greek waters (Petrakis & Stergiou, 1995; Stergiou & Moutopoulos, 2001; Moutopoulos & Stergiou, 2002; Koutrakis & Tsikliras, 2003; Lamprakis *et al.*, 2003; Liousia *et al.*, 2012); Turkish waters of the Mediterranean and Black Sea (Can *et al.*, 2002; Filiz & Mater, 2002; Filiz & Bilge, 2004; Cicek *et al.*, 2006; Karakulak *et al.*, 2006; Özyaydin & Taskavak, 2006; Akyol *et al.*, 2007; Demirhan & Can, 2007; Gurkan & Taşkavak, 2007; Ismen *et al.*, 2007, 2009; Özyaydin *et al.*, 2007; Sangun *et al.*, 2007; Yeldan & Avsar, 2007; Ilkyaz *et al.*, 2008; Kalayci *et al.*, 2007; Bayhan *et al.*, 2009; Erguden *et al.*, 2009; Ozen *et al.*, 2009; Yiğın & Ismen, 2009; Başusta *et al.*, 2012; Güven *et al.*, 2012), as well as the North African coasts of

the Mediterranean Sea (Abdallah, 2002; Cherif *et al.*, 2008; Ben Amor *et al.*, 2011; Ghailen *et al.*, 2010).

From 2009–2012, data on length and weight were collected for individuals of all fish species encountered during scientific research surveys conducted onboard the RV *Cefas Endeavour* around the British Isles. The primary aim for the collection of such information was to help validate the data in the Fishing Survey System (FSS) database, and to improve ongoing quality assurance of field data.

The results of these investigations are provided in the present report with additional information from other published studies also provided so that the length-weight relationships can be summarised for those fish that may be encountered on the continental shelf around the British Isles (Wheeler, 1992; Wheeler *et al.*, 2004).

2. Methods

2.1 Surveys used

Data were collected mainly during annual Cefas groundfish surveys, conducted under the European Commission (EC) Data Collection Framework. Most of these surveys are coordinated under the International Council for the Exploration of the Sea (ICES) through the Working Group on Beam Trawl Surveys (WGBEAM) and International Bottom Trawl Survey Working Group (IBTSWG) (ICES, 2009, 2012).

Data were collected around much of the British Isles (Figure 1) during the period 2009–2012¹. Additional data for smaller species (e.g. gobies and clingfish) were collected during an ecosystem survey of the western English Channel and Celtic Sea that involved the collection of epibenthos and small fish with 2m beam trawl. Similarly, additional data for garfish and saury pike were collected during a recently initiated multidisciplinary survey to the south-west of England, which was developed to study small pelagic fish and the pelagic ecosystem². These data were included in this report, although further data for these species will be collected in subsequent studies. The surveys during which length and weight data were collected are summarised in Table 1.

The main gears used were 4m beam trawl (BT) and two types of otter trawl, the 'Grande ouverture vertical' (GOV) trawl and 'Portuguese high headline trawl' (PHHT), which sample different fish (in terms of species composition and size distribution). Beam trawl surveys were designed to sample commercial flatfish species (e.g. plaice and sole) but also sample a variety of non-commercial species (e.g. poor cod, solenette, pogge, dragonets and lesser-spotted dogfish). The otter trawls were better adapted to sampling roundfish (e.g. cod, haddock, whiting) and larger demersal species, and the high headline heights of these trawls also allowed small pelagic fish (e.g. herring and mackerel) to be sampled.

2.2 Measurements

Length and weight data were collected for all fish species observed during the surveys, including commercial and non-commercial species. All species were measured as total length (with the caudal fin depressed, and to the centimetre below), except for some small-bodied species

(see below). Fish were generally measured on balances appropriate to the size of the fish, with the smallest individuals weighed to 0.1g, medium-sized fish to 1g and the larger individuals weighed on balances with a resolution of 5g (or 10g for exceptionally large individuals).

Exceptions for this included various clupeiform species (anchovy, herring, pilchard and sprat) that were measured routinely to the 0.5cm below. Additional data for smaller-bodied species (e.g. two-spotted clingfish and gobies) were also collected with fish measured to the millimetre below and weighed to 0.1g.

Although the fish species encountered in the present surveys were all measured as total length (L_T), there are other measurements that can be used to measure other species (Table 2), and future studies to better understand length-length conversion factors are still required for some species.

2.3 Electronic data collection

The majority of data were collected electronically using Cefas' Electronic Data Capture (EDC) system, this hardware and software system captures and stores data from research vessel surveys (Annex 1). The system includes data tables for catch weights (by species, sex and category) which can be linked to data tables for station details, gear, numbers at length and biological information (individual weight, sex, maturity, otolith collection etc.). Additional data for smaller fish (measured to the mm and 0.1g) were recorded outside the EDC system.

2.4 Data quality

Data presented in this study were subject to quality checks, in terms of examination of length-weight plots to identify outliers (e.g. smaller and larger weights for a specific length, allowing for an appropriate degree of variability). Likely erroneous values were corrected where possible or excluded from further analysis. Input errors resulting from an incorrect species code or potential misidentification were checked through examining the observed spatial distributions and length ranges observed. Examples of misidentifications included spotted dragonet *Callionymus maculatus* that were much greater than the known maximum length and were consistent with being common dragonet *C. lyra*, and shagreen ray *Leucoraja fullonica* reported from areas outside their distribution (ICES Divisions VIIId and IVc) that were subsequently known to be small-eyed ray *Raja microocellata*.

There was possible taxonomic confusion between some pairs of sympatric species (such as starry smooth-

1 Additional length-weight data were collected during a survey in spring 2013, including for various gobies, rocklings and other infrequent species. Although not included here, these data will be reported in the future.

2 Defra Project – Pelagic Ocean Science: Ecology and Interconnectivity of Diverse Ocean Networks (POSEIDON)

Figure 1: Main survey fishing stations where length-weight data were collected during 2009–2012.

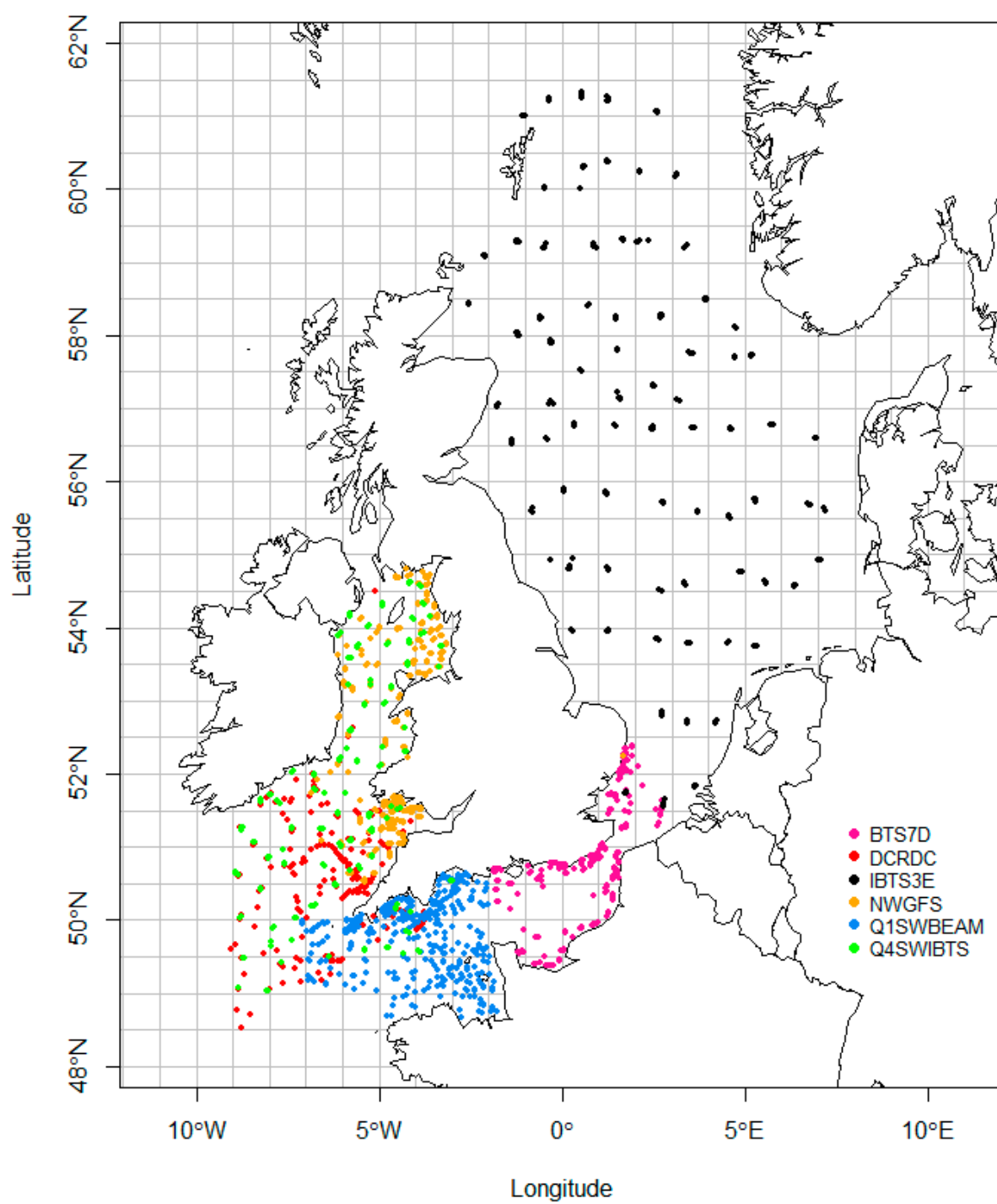


Table 1: List of surveys considered for this study including season (quarter), area (ICES Divisions), gear used and years included in the analysis.

Survey	Season	Year	Area	Gear	References
English North Sea groundfish survey (IBTS3E)	3	2009–2012*	IVa–c	GOV trawl	ICES, 2012
Eastern English Channel and Southern North Sea beam trawl (BTS7D)	3	2009–2012*	VIIId, IVc	4 m BT	ICES, 2009; Parker-Humphreys, 2005
Western English Channel beam trawl (Q1SWBEAM)	1	2009–2012	VIIe	Twin 4 m BT (with and without blinder)	–
English Near West Coast beam trawl (NWGFS)	3	2009–2012*	VIIa, f–g	4 m BT	ICES, 2009; Parker-Humphreys, 2004a,b
English Celtic and Irish Sea groundfish survey (Q4SWIBTS)	4	2009–2011	VIIa, e–h	GOV (standard and with rockhopper for rough grounds)	Harley & Ellis, 2007; ICES, 2012
EU Data Regulation (DCRDC)	1	2009–2010	VIIIf–h	PHHT	–
Western Channel and Celtic Sea ecosystem survey	2	2011	VIIe–h	2 m BT	–
Western Channel and Celtic Sea pelagic survey (PELTIC)	4	2012	VIIe–g	Foto trawl and Engel 800 trawl	–

* Data from 2012 were only used for those species or size categories for which data were limited.

hound *Mustelus asterias* and common smooth-hound *M. mustelus*, greater pipefish *Syngnathus acus* and Nilsson's pipefish *S. rostellatus*, sandeels *Ammodytes marinus* and *A. tobianus*, various sand gobies *Pomatoschistus* spp., redfish *Sebastes* spp. and sea snail *Liparis* spp.) and data for these were combined at genus or family level.

Common skate (*Dipturus batis*) data were considered as *Dipturus batis*-complex, as recent taxonomic studies (Griffiths *et al.*, 2010; Iglésias *et al.*, 2010) have differentiated two species *Dipturus batis* (*D. cf. flossada*) and *D. cf. intermedia*, although proposed taxonomic changes are still to be ratified.

2.5 Data analysis

Data for the main surveys were extracted from FSS into a Microsoft® Access database. Additional data (from paper records for small-bodied fish measured more accurately) were collated in Microsoft® Excel. All data were then imported into R, and the length-weight conversion factors were estimated using R software (R Development Core Team, 2012).

Fish length and weight relationships were calculated using the exponential relationship:

$$W_T = a \times L_T^b$$

where W_T is total weight (g), L_T is the total length (all data standardised to cm), and factors a (intercept) and b (slope) were estimated using linear regression through natural logarithmic transformation ($\ln W_T = \ln a + b \times \ln L_T$).

Table 2: Definitions of how fish may be measured on IBTS surveys.

Measurement		Description	Taxa used for
Total length	L_T	Distance from the tip of the snout to the furthest point of the caudal fin when depressed in line with the body.	Measurement used in present study.
Fork length	L_F	Distance from the tip of the snout to the center of the fork in the caudal fin.	Typically used by other organisations for tuna and lamnid sharks.
Lower jaw fork length	L_{LJF}	Distance from the tip of the lower jaw to the center of the fork in the caudal fin.	Typically used for billfishes.
Standard length	L_S	Distance from the tip of the snout to the end of the caudal peduncle (excluding caudal fins).	Should be used for smoothheads (Alepocephalidae) and seasnails (Serranidae) (ICES, 2012).
Pre supra caudal fin length	L_{PSC}	Distance from the tip of the snout to the furthest point prior the supra caudal fin.	Used for rabbit fish except Rhinichthys, which are measured to total length (ICES, 2012).
Pre anal fin length	L_{PAF}	Distance from the tip of the snout to the first anal fin ray.	Used on grenadiers (Macrouridae) (ICES, 2012).
Disc width	D_W	Distance between the tips of the pectoral fins.	Often used for stingrays (Myliobatiformes), as the long whip-like tail can be damaged. Sometimes used for electric rays (Torpedinidae) and skates (Rajidae), especially as the tails of the latter can occasionally be damaged. McCully <i>et al.</i> (2012) provided further information on length-width conversion factors for skates around the British Isles.
Disc length	D_L	Distance between the snout and the posterior margin of the pectoral fin.	Often used for batoid fish.
Head length	L_H	Distance from the tip of the snout to the furthest point of the operculum.	
Head length, trunk length and tail length	L_{Hr} L_{Tr} L_{Ta}	The measurements for head length (the distance from the tip of the snout to the mid-point of the cleithral ring, a bony ring that is just posterior to the operculum), trunk length (distance between the mid-point of the cleithral ring and the last trunk ring) and tail length (from the last trunk ring to the tip of the tail, when outstretched), measured using callipers.	Typically used for sea horses <i>Hippocampus</i> spp. (Lourie, 2003), for which the three measurements can be combined to estimate total length.
Total weight	W_T	Total weight of the fish.	Measurement used in present study. As such, it includes the weights of the reproductive organs, liver, intestines and gut contents. Consequently, this measurement can be more variable than eviscerated weight.
Eviscerated weight	W_E	Weight of the fish after the organs from the body cavity (intestines, liver, reproductive organs) are removed. Flatfish eviscerated weight may include gonads (Bedford <i>et al.</i> , 1986).	

3. Results and Discussion

Length data were available for 145,771 individuals from 138 taxa. Fish species with limited observations during the time period are summarised in Table 3, and more contemporary data on the lengths and weights of these species could usefully be collected (e.g. from future surveys and other internationally-coordinated groundfish surveys).

There are a number of factors that may result in a high variability in the weight at length for any given fish species,

including sex (e.g. one sex may have a wider length range, ovarian weight is usually larger than the weight of the testes), maturity stage and gonad size, weight of stomach contents, liver weight, parasite load, as well as the overall condition of the fish.

Seasonal sampling and gear selectivity may result in different length and weight ranges observed for some species between the surveys. For example, herring and

Table 3: Summary of lesser-known species encountered in this study during the time period 2009–2012, for which data were too limited to estimate length-weight parameters accurately. Species denoted * are included in Table 5, but further data are required. The higher taxonomic order follows Eschemeyer (2013). Further data on all these species are required.

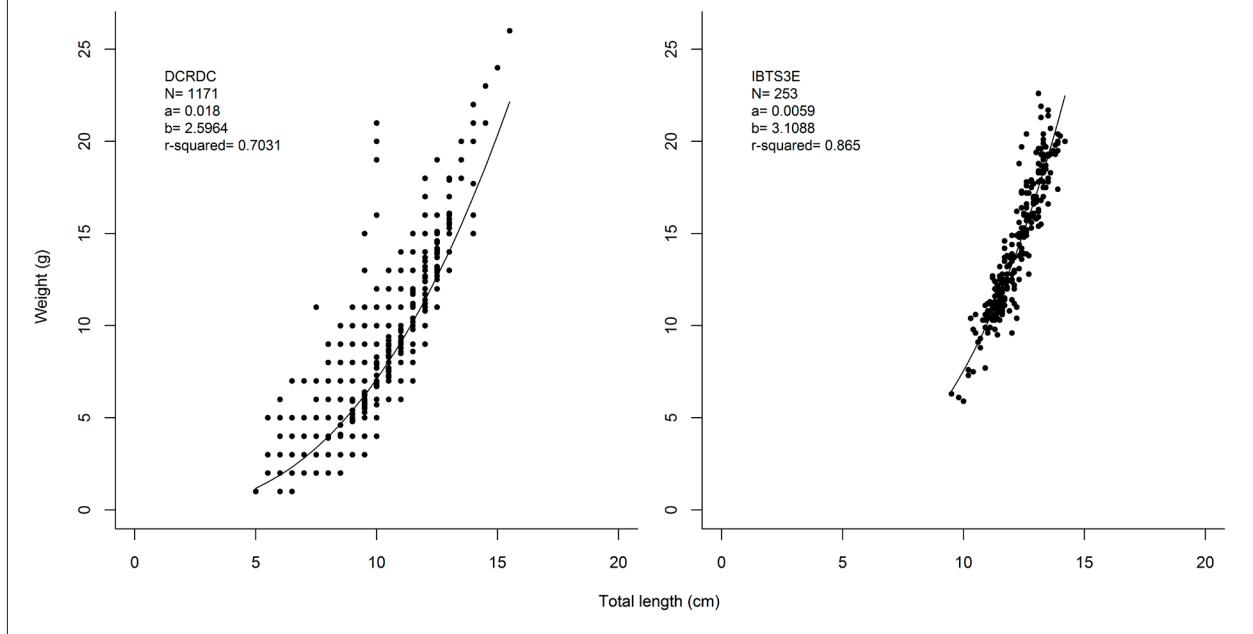
Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	Survey
Petromyzonidae	<i>Lampetra fluviatilis</i> River lamprey	Irish Sea and Celtic Seas (GOV)	1	25	28	Q4SWIBTS
Chimaeridae	<i>Chimaera monstrosa</i> Rabbit fish	North Sea	5	21–23	27–40	IBTS3E
Lamnidae	<i>Lamna nasus</i> Porbeagle shark	Irish Sea and Celtic Seas (GOV)	1	146	26060	Q4SWIBTS
Torpedinidae	<i>Torpedo nobiliana</i> Common electric ray	Irish Sea and Celtic Seas (GOV)	1	121	33300	Q4SWIBTS
Squatinae	<i>Squatina squatina</i> Angel shark	Irish Sea and Celtic Seas (BT)	1	37	551	NWGFS
Anguillidae	<i>Anguilla anguilla</i> European eel	North Sea	7	34–64	64–592	IBTS3E
		Southern North Sea and Eastern English Channel				BTS7D
		Irish Sea and Celtic Seas (GOV)				Q4SWIBTS
Clupeidae	<i>Alosa alosa</i> Allis shad	North Sea	1	37	374	IBTS3E
	<i>Alosa fallax</i> Twaite shad	North Sea	7	35–43	388–601	IBTS3E
Salmonidae	<i>Salmo trutta</i> Sea trout	Irish Sea and Celtic Seas (GOV)	1	42	680	Q4SWIBTS
Gadidae	<i>Raniceps raninus</i> Tadpole fish	Celtic Seas	6	4–11	0.7–19	DCRDC
		Irish Sea and Celtic Seas (BT)				NWGFS
		Irish Sea and Celtic Seas (GOV)				Q4SWIBTS
Lotidae	<i>Brosme brosme</i> Tusk	North Sea	4	30–69	276–2945	IBTS3E
	<i>Gaidropsarus macrophthalmus</i> Big-eye rockling	Irish Sea and Celtic Seas (GOV)	1	8	4	Q4SWIBTS

continued

Table 3: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	Survey
Gobiesocidae	<i>Lepadogaster candolli</i> Connemarra clingfish	Irish Sea and Celtic Seas (BT)	1	4	1	NWGFS
Belonidae	<i>Belone belone</i> Garfish	Celtic Seas	9	56–70	249–615	DCRDC
		North Sea				IBTS3E
		Irish Sea and Celtic Seas (GOV)				Q4SWIBTS
		South-West area				PELTIC
Scomberesocidae	<i>Scomberesox saury</i> Saury pike	South-West area	2	28.5–29	58.5–70	PELTIC
Gasterosteidae	<i>Spinachia spinachia</i> Sea stickleback	Irish Sea and Celtic Seas (BT)	1	11.7	4.6	NWGFS
Scorpaenidae	<i>Helicolenus dactylopterus</i> Blue-mouth redfish	North Sea	1	11	26	IBTS3E
Triglidae	<i>Aspitrigla obscura</i> Long-finned gurnard	Celtic Seas	2	12–23	13–89	DCRDC
		Western English Channel				Q1SWBEAM
Cottidae	<i>Triglops murrayi</i> Moustache sculpin	North Sea	2	8–14	5–28	IBTS3E
Cyclopteridae	<i>Cyclopterus lumpus</i> * Lumpsucker	Celtic Seas	12	4–34	3–2452	DCRDC
		North Sea				IBTS3E
		Irish Sea and Celtic Seas (GOV)				Q4SWIBTS
Mugilidae	<i>Liza aurata</i> Golden grey mullet	Southern North Sea and Eastern English Channel	1	48	1561	BTS7D
	<i>Liza ramada</i> Thin-lipped grey mullet	North Sea	1	55	1533	IBTS3E
Labridae	<i>Acantholabrus palloni</i> Scale-rayed wrasse	Western English Channel	1	22	181	Q1SWBEAM
	<i>Centrolabrus exoletus</i> Small-mouthed wrasse	Western English Channel	5	4–13	2–34	Q1SWBEAM
		Irish Sea and Celtic Seas (BT)				NWGFS
	<i>Symphodus melops</i> Corkwing wrasse	Southern North Sea and Eastern English Channel	1	12	27	BTS7D
Zoarcidae	<i>Zoarces viviparus</i> Eelpout	Celtic Seas	3	12–14	13–29	DCRDC
		Western English Channel				Q1SWBEAM
		Irish Sea and Celtic Seas (BT)				NWGFS
	<i>Lycodes gracilis</i> Vahl's eelpout	North Sea	2	13–14	10–14	IBTS3E
Stichaeidae	<i>Chirolophis ascanii</i> Yarrell's blenny	Western English Channel	4	6–17	1–39	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)				Q4SWIBTS
Gobiidae	<i>Crystallogobius linearis</i> Crystal goby	Celtic Seas	2	1.4–4.8	0.3–0.4	Ecosystem survey
		Irish Sea and Celtic Seas (GOV)				Q4SWIBTS
	<i>Gobius gasteveni</i> * Steven's goby	Western English Channel	11	7–10.4	3–12.3	Q1SWBEAM
Balistidae	<i>Balistes capriscus</i> Trigger fish	Irish Sea and Celtic Seas (GOV)	1	33	682	Q4SWIBTS

Figure 2: Length-weight relationship for sprat *Sprattus sprattus* collected with two different protocols. The DCRDC (left) collected data to 0.5 cm and 1 g (N=1171, $r^2=0.7031$) for 2009–2010. The IBTS3E (right) collected data to 0.1 cm and 0.1 g (N=253, $r^2=0.865$) for the year 2012.



mackerel captured during the summer English North Sea groundfish survey may have well-developed gonads, as they are likely to be caught just prior to or in their spawning season (Ellis *et al.*, 2012). In terms of gear selectivity, beam trawlers are expected to catch proportionally more small-size classes than otter trawlers, and so catches may not be representative of the overall length range.

Species for which the sample size and length range were deemed sufficient to provide survey-specific length-weight relationships are provided in Table 4 and Annex 2. It should be noted that not all surveys were shown for each species, as some surveys were limited by data availability. In addition, species occurring in only one survey with sufficient data were also included on this table. If survey-specific data were limited (e.g. by sample size), then data across all surveys were combined.

The length-weight relationships were significant for all species, with r^2 values ranging from 0.5744 (Jeffrey's goby *Buenia jeffreysii*) to 0.9967 (wolf-fish *Anarhichas lupus*), and total length and total weight were strongly correlated ($r^2 \geq 0.95$) for approximately 63% of all species. The 'b' values for nearly all fish ranged from 2.0911–3.5789. The exceptions to this were pearlside *Maurolicus muelleri* ($b=1.6065$), two-spotted clingfish *Diplecogaster bimaculata* ($b=1.8205$) and snake blenny *Lumpenus lampretaeformis* ($b=1.9847$). Further data collection may be required for these species.

The length-weight data for all species were combined across surveys to provide a single summary of length-weight conversion factors for British marine fish. For those species for which the present study had no or limited data, then information from relevant literature were used (Table 5).

For fish species that have a restricted length range, and that were only measured to the cm (or 0.5 cm) and

weighed to 1 g, the resulting length-weight relationship could have a poorer fit than for when fish were measured to the mm and 0.1 g, even if sample sizes were lower for the latter. This is illustrated for sprat (Figure 2). Hence, future surveys need to consider the optimum resolution for collecting data on the length and weight of some fish species, which may require current sampling protocols to be reviewed, noting that such modifications can be implemented in the EDC system.

The current study has provided contemporary length-weight parameters for a broad range of northern European fishes. It should be noted that some species (e.g. commercial species and elasmobranchs) may benefit from more detailed analysis to obtain sex-specific length-weight relationships. Future studies could usefully collect further data for less frequent species that were sampled rarely, and also specimens at either the lower and/or upper end of the size distribution for other species.

Table 4: Survey-specific length-weight relationships for the most frequently sampled fish species encountered on the continental shelf of the British Isles. The higher taxonomic order follows Eschemeyer (2013). Species for which data were combined across surveys are included in Table 5.

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Myxiniidae	<i>Myxine glutinosa</i> Hagfish	North Sea	59	19 – 43	10 – 110	0.0167	2.2466	0.7724	IBTS3E
Scyllorhinidae	<i>Scyllorhinus canicula</i> Lesser-spotted dogfish	Southern North Sea and Eastern English Channel	305	12 – 66	7 – 1009	0.0043	2.9436	0.9861	BTS7D
		Celtic Seas	1353	12 – 71	6 – 1446	0.0019	3.1541	0.9836	DCRDC
		North Sea	219	10 – 76	5 – 1487	0.0026	3.0806	0.9862	IBTS3E
		Irish Sea and Celtic Seas (BT)	1668	23 – 71	40 – 1358	0.0018	3.1641	0.9716	NWGFS
Triakidae	<i>Mustelus</i> spp. Smooth-hound	Western English Channel	708	8 – 70	3 – 1442	0.0025	3.0958	0.9820	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	1420	10 – 69	4 – 1394	0.0022	3.1220	0.9790	Q4SWIBTS
		Southern North Sea and Eastern English Channel	19	26 – 96	50 – 3770	0.0019	3.1596	0.9933	BTS7D
		Celtic Seas	88	30 – 94	99 – 3400	0.0023	3.1073	0.9912	DCRDC
		North Sea	78	22 – 98	36 – 3082	0.0035	2.9895	0.9962	IBTS3E
		Irish Sea and Celtic Seas (BT)	166	26 – 97	62 – 3140	0.0035	3.0044	0.9884	NWGFS
		Western English Channel	124	34 – 112	114 – 6930	0.0014	3.2066	0.9906	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	227	28 – 113	88 – 6430	0.0036	2.9994	0.9911	Q4SWIBTS
		Western English Channel	17	15 – 49	101 – 2755	0.0400	2.8568	0.9915	Q1SWBEAM
		North Sea	448	8 – 51	4 – 1104	0.0107	2.9400	0.9755	IBTS3E
Torpedinidae	<i>Torpedo marmorata</i> Marbled electric ray	Celtic Seas	135	11 – 69	10 – 1916	0.0045	3.0785	0.9939	DCRDC
		North Sea	131	15 – 64	17 – 1484	0.0026	3.2169	0.9760	IBTS3E
		Irish Sea and Celtic Seas (BT)	133	11 – 61	8 – 1488	0.0036	3.1396	0.9888	NWGFS
		Western English Channel	150	13 – 72	12 – 2465	0.0033	3.1653	0.9951	Q1SWBEAM
Rajidae	<i>Amblyraja radiata</i> Starry ray	Irish Sea and Celtic Seas (GOV)	69	11 – 67	6 – 1930	0.0024	3.2455	0.9833	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Clupeidae	<i>Raja brachyura</i> Blonde ray	Southern North Sea and Eastern English Channel	17	19 – 80	32 – 4120	0.0018	3.3709	0.9950	BTS7D
		Celtic Seas	40	20 – 108	45 – 11940	0.0026	3.2750	0.9959	DCRDC
		Irish Sea and Celtic Seas (BT)	199	16 – 90	19 – 6400	0.0028	3.2495	0.9825	NWGFS
		Western English Channel	36	13 – 83	11 – 3360	0.0037	3.1468	0.9940	Q1SWBEAM
	<i>Raja clavata</i> Thornback ray	Irish Sea and Celtic Seas (GOV)	60	24 – 90	69 – 5540	0.0015	3.3999	0.9928	Q4SWIBTS
		Southern North Sea and Eastern English Channel	756	13 – 94	13 – 5160	0.0058	3.0166	0.9905	BTS7D
		Celtic Seas	91	19 – 89	35 – 5980	0.0024	3.2653	0.9842	DCRDC
		North Sea	95	16 – 93	21 – 4645	0.0045	3.0686	0.9907	IBTS3E
	<i>Raja montagui</i> Spotted ray	Irish Sea and Celtic Seas (BT)	947	11 – 91	7 – 5740	0.0041	3.1172	0.9907	NWGFS
		Western English Channel	123	10 – 82	9 – 6170	0.0048	3.0855	0.9921	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	405	10 – 90	6 – 5509	0.0035	3.1660	0.9953	Q4SWIBTS
		Southern North Sea and Eastern English Channel	50	14 – 62	11 – 1647	0.0041	3.1014	0.9934	BTS7D
	<i>Clupea harengus</i> Herring	Celtic Seas	211	10 – 67	8 – 2483	0.0036	3.1489	0.9820	DCRDC
		North Sea	136	30 – 69	144 – 2370	0.0045	3.0862	0.9563	IBTS3E
		Irish Sea and Celtic Seas (BT)	891	12 – 60	13 – 1566	0.0044	3.0963	0.9849	NWGFS
		Western English Channel	61	12 – 66	9 – 2380	0.0045	3.0832	0.9935	Q1SWBEAM
	<i>Sprattus sprattus</i> Sprat	Irish Sea and Celtic Seas (GOV)	346	10 – 67	7 – 2063	0.0033	3.1814	0.9823	Q4SWIBTS
		Celtic Seas	921	7 – 28	2 – 196	0.0043	3.1542	0.9838	DCRDC
		North Sea	3126	7.5 – 35.5	3 – 477	0.0048	3.1984	0.9641	IBTS3E
		Irish Sea and Celtic Seas (GOV)	944	7.5 – 29.5	2 – 230	0.0037	3.2200	0.9776	Q4SWIBTS
	<i>Sprattus sprattus</i> Sprat	Celtic Seas	1171	5 – 15.5	1 – 26	0.0180	2.5964	0.7031	DCRDC
		North Sea	253	9.5 – 14.2	5.9 – 22.6	0.0059	3.1088	0.8650	IBTS3E
		Irish Sea and Celtic Seas (GOV)	1140	5 – 15.5	1 – 32	0.0059	3.0974	0.8387	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Argentinidae	<i>Argentina</i> spp. Argentine	Celtic Seas	441	6 – 23	2 – 78	0.0039	3.1669	0.9608	DCRDC
		North Sea	525	9 – 24	3 – 97	0.0050	3.0754	0.9576	IBTS3E
Gadidae	<i>Gadus argenteus</i> Silvery pout	Irish Sea and Celtic Seas (GOV)	728	4 – 25	0.6 – 91	0.0071	2.9649	0.9702	Q4SWIBTS
		Celtic Seas	127	7 – 12	2 – 16	0.0073	3.0955	0.4996	DCRDC
		North Sea	619	4 – 15	1 – 32	0.0200	2.7052	0.7942	IBTS3E
		Irish Sea and Celtic Seas (GOV)	124	6 – 15	2 – 24	0.0372	2.3861	0.7517	Q4SWIBTS
		Southern North Sea and Eastern English Channel	25	8 – 66	6 – 2657	0.0143	2.9126	0.9941	BTS7D
	<i>Gadus morhua</i> Cod	Celtic Seas	190	15 – 101	32 – 12960	0.0074	3.1025	0.9957	DCRDC
		North Sea	1085	16 – 111	40 – 15000	0.0081	3.0502	0.9929	IBTS3E
		Irish Sea and Celtic Seas (BT)	358	8 – 67	4 – 3545	0.0106	3.0000	0.9937	NWGFS
		Western English Channel	66	21 – 82	87 – 6240	0.0059	3.1507	0.9959	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	349	8 – 119	5 – 19360	0.0085	3.0631	0.9964	Q4SWIBTS
<i>Melanogrammus aeglefinus</i> Haddock	Celtic Seas	Celtic Seas	1773	13 – 82	21 – 5645	0.0077	3.0673	0.9903	DCRDC
		North Sea	2725	9 – 68	7 – 3136	0.0092	3.0126	0.9816	IBTS3E
		Irish Sea and Celtic Seas (BT)	302	11 – 51	11 – 836	0.0113	2.9600	0.9792	NWGFS
		Western English Channel	394	16 – 65	31 – 2350	0.0091	3.0174	0.9847	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	1629	11 – 73	13 – 4235	0.0080	3.0669	0.9872	Q4SWIBTS
	<i>Merlangius merlangus</i> Whiting	Southern North Sea and Eastern English Channel	446	5 – 45	1 – 560	0.0166	2.7708	0.9867	BTS7D
		Celtic Seas	1533	9 – 61	6 – 1937	0.0056	3.1252	0.9858	DCRDC
		North Sea	2922	4.7 – 55	1 – 1428	0.0099	2.9433	0.9825	IBTS3E
		Irish Sea and Celtic Seas (BT)	603	6 – 54	3 – 1398	0.0116	2.8810	0.9832	NWGFS
		Western English Channel	544	11 – 55	9 – 1176	0.0061	3.0981	0.9777	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	1832	7 – 62	2 – 1998	0.0060	3.1070	0.9850	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
	<i>Micromesistius poutassou</i> Blue whiting	Celtic Seas	576	11 – 28	6 – 181	0.0046	3.0927	0.9228	DCRDC
		North Sea	496	11 – 41	10 – 476	0.0038	3.1846	0.9880	IBTS3E
		Western English Channel	164	13 – 37	13 – 358	0.0050	3.0327	0.9474	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	1526	13 – 35	8 – 389	0.0073	2.9629	0.8748	Q4SWIBTS
		North Sea	710	23 – 113	103 – 12200	0.0085	3.0242	0.9837	IBTS3E
	<i>Pollachius virens</i> Saithe								
		Celtic Seas	569	9 – 22	4 – 97	0.0102	2.8933	0.9271	DCRDC
	<i>Trisopterus esmarki</i> Norway pout	North Sea	963	6 – 25	1 – 115	0.0075	3.0244	0.9596	IBTS3E
		Irish Sea and Celtic Seas (BT)	323	6 – 18	2 – 74	0.0062	3.1226	0.9413	NWGFS
		Irish Sea and Celtic Seas (GOV)	1274	9 – 24	5 – 110	0.0083	3.0059	0.8915	Q4SWIBTS
	<i>Trisopterus luscus</i> Bib	Southern North Sea and Eastern English Channel	546	3 – 35	1 – 530	0.0157	2.9258	0.9720	BTS7D
		Celtic Seas	234	14 – 42	35 – 1029	0.0103	3.0584	0.9725	DCRDC
		Irish Sea and Celtic Seas (BT)	175	4 – 32	1 – 431	0.0133	2.9925	0.9788	NWGFS
		Western English Channel	607	11 – 46	10 – 1224	0.0076	3.1545	0.9626	Q1SWBEAM
	<i>Trisopterus minutus</i> Poor cod	Irish Sea and Celtic Seas (GOV)	106	4 – 42	4 – 1083	0.0305	2.7204	0.9698	Q4SWIBTS
		Southern North Sea and Eastern English Channel	360	4 – 21	1 – 86	0.0157	2.8713	0.9639	BTS7D
		Celtic Seas	2353	6 – 26	2 – 206	0.0096	3.0101	0.9630	DCRDC
		North Sea	519	6 – 20	2 – 80	0.0082	3.0865	0.9505	IBTS3E
		Irish Sea and Celtic Seas (BT)	1211	6 – 24	2 – 165	0.0103	3.0187	0.9746	NWGFS
		Western English Channel	558	8 – 23	4 – 105	0.0117	2.9054	0.9360	Q1SWBEAM
Lotidae	<i>Gaidropsarus mediterraneus</i> Shore rockling	Irish Sea and Celtic Seas (GOV)	1254	6 – 24	3 – 154	0.0111	2.9658	0.9609	Q4SWIBTS
		Celtic Seas	11	5 – 11	1 – 12	0.0133	2.8387	0.8246	DCRDC

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Merlucciidae	<i>Merluccius merluccius</i> European hake	Celtic Seas	826	6 – 94	1 – 6660	0.0049	3.0958	0.9886	DCRDC
		North Sea	1036	6 – 103	1 – 8920	0.0076	2.9722	0.9934	IBTS3E
		Irish Sea and Celtic Seas (BT)	74	11 – 91	10 – 6300	0.0044	3.1391	0.9919	NWGFS
		Western English Channel	156	11 – 86	9 – 4180	0.0058	3.0699	0.9871	Q1SWBEAM
Lophiidae	<i>Lophius piscatorius</i> Anglerfish	Irish Sea and Celtic Seas (GOV)	719	5 – 109	1 – 9600	0.0062	3.0369	0.9907	Q4SWIBTS
		Celtic Seas	433	8 – 111	9 – 24060	0.0258	2.8722	0.9849	DCRDC
		North Sea	84	5 – 91	4 – 11280	0.0297	2.8410	0.9924	IBTS3E
		Irish Sea and Celtic Seas (BT)	172	10 – 103	21 – 14980	0.0244	2.8683	0.9899	NWGFS
		Western English Channel	1215	13 – 104	32 – 19260	0.0290	2.8401	0.9718	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	186	6 – 100	4 – 13000	0.0225	2.9014	0.9869	Q4SWIBTS
Caproidae	<i>Capros aper</i> Boarfish	Celtic Seas	414	3 – 17	1 – 96	0.0594	2.5847	0.9535	DCRDC
		Western English Channel	161	3 – 18	1 – 170	0.0345	2.8298	0.9793	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	403	1.9 – 20	0.1 – 146	0.0624	2.5942	0.9635	Q4SWIBTS
		North Sea	44	14 – 30	39 – 427	0.0178	2.9724	0.9708	IBTS3E
Scorpaenidae	<i>Sebastes</i> spp. Redfish								
Triglidae	<i>Aspitrigla cuculus</i> Red gurnard	Southern North Sea and Eastern English Channel	159	17 – 42	46 – 716	0.0091	3.0108	0.9780	BTS7D
		Celtic Seas	420	8 – 39	5 – 616	0.0075	3.0755	0.9899	DCRDC
		North Sea	23	15 – 31	31 – 261	0.0156	2.8276	0.9448	IBTS3E
		Irish Sea and Celtic Seas (BT)	394	7 – 39	5 – 629	0.0108	2.9705	0.9659	NWGFS
		Western English Channel	768	7 – 45	6 – 887	0.0086	3.0373	0.9875	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	391	9 – 41	7 – 683	0.0110	2.9596	0.9736	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Agonidae	<i>Eutrigla gurnardus</i> Grey gurnard	Celtic Seas	916	7 – 39	3 – 550	0.0065	3.0771	0.9806	DCRDC
		North Sea	1501	5 – 41	1 – 608	0.0160	2.8151	0.9582	IBTS3E
		Irish Sea and Celtic Seas (BT)	865	3.7 – 35	2.4 – 415	0.0118	2.8829	0.9555	NWGFS
		Western English Channel	319	9 – 41	6 – 643	0.0083	2.9860	0.9684	Q1SWBEAM
	<i>Trigla lucerna</i> Tub gurnard	Irish Sea and Celtic Seas (GOV)	1080	7 – 41	2 – 685	0.0094	2.9505	0.9809	Q4SWIBTS
		Southern North Sea and Eastern English Channel	161	16 – 44	41 – 882	0.0134	2.9165	0.9710	BTS7D
		Celtic Seas	176	5 – 52	1 – 1861	0.0092	3.0139	0.9906	DCRDC
		North Sea	69	20 – 52	89 – 1308	0.0122	2.9595	0.9800	IBTS3E
	<i>Agonus cataphractus</i> Pogge	Irish Sea and Celtic Seas (BT)	221	4 – 50	1 – 1627	0.0124	2.9399	0.9906	NWGFS
		Western English Channel	348	9 – 63	8 – 3264	0.0070	3.1014	0.9880	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	232	5 – 56	2 – 2038	0.0116	2.9643	0.9893	Q4SWIBTS
		Southern North Sea and Eastern English Channel	538	4 – 14	1 – 24	0.0362	2.4025	0.8957	BTS7D
Carangidae	<i>Trachurus trachurus</i> Horse mackerel	Celtic Seas	62	4 – 13	1 – 21	0.0085	3.0371	0.9165	DCRDC
		North Sea	152	3 – 16	1 – 28	0.0372	2.3604	0.8188	IBTS3E
		Irish Sea and Celtic Seas (BT)	1108	3 – 15	0.8 – 26	0.0275	2.5208	0.8612	NWGFS
		Western English Channel	279	4 – 14	1 – 40	0.0074	3.0948	0.8937	Q1SWBEAM
	<i>Trachurus trachurus</i> Horse mackerel	Irish Sea and Celtic Seas (GOV)	61	4 – 13	0.8 – 18	0.0111	2.8818	0.9130	Q4SWIBTS
		Celtic Seas	586	6 – 32	1 – 279	0.0086	2.9631	0.9704	DCRDC
		North Sea	1155	4 – 39	1 – 544	0.0316	2.6520	0.9817	IBTS3E
		Western English Channel	247	9 – 28	5 – 153	0.0080	2.9739	0.9679	Q1SWBEAM
	<i>Lumpenus lampretaeformis</i> Snake blenny	Irish Sea and Celtic Seas (GOV)	1307	4 – 37	0.4 – 464	0.0100	2.9722	0.9822	Q4SWIBTS
		North Sea	41	20 – 37	12 – 43	0.0342	1.9847	0.7029	IBTS3E

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Anarhichadidae	<i>Anarhichas lupus</i> Wolf-fish	North Sea	20	23 – 94	94 – 9250	0.0046	3.1849	0.9967	IBTS3E
Trachinidae	<i>Echichthys vipera</i> Lesser weever	Southern North Sea and Eastern English Channel	257	8 – 16	4 – 50	0.0442	2.5001	0.5817	BTS7D
		North Sea	1024	5 – 17	1 – 62	0.0164	2.8996	0.8571	IBTS3E
		Irish Sea and Celtic Seas (BT)	512	6 – 18	3 – 79	0.0180	2.8398	0.8779	NWGFS
		Western English Channel	72	6 – 18	3 – 61	0.0157	2.8791	0.8938	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	121	5.3 – 18	1.4 – 71	0.0070	3.2073	0.9055	Q4SWIBTS
		Southern North Sea and Eastern English Channel	1226	2 – 24	1 – 99	0.0272	2.5574	0.9340	BTS7D
Callionymidae	<i>Callionymus lyra</i> Common dragonet	Celtic Seas	622	4 – 30	1 – 164	0.0199	2.6373	0.9665	DCRDC
		North Sea	287	6 – 25	2 – 82	0.0218	2.5881	0.9022	IBTS3E
		Irish Sea and Celtic Seas (BT)	1287	3.4 – 27	0.4 – 150	0.0187	2.7169	0.9436	NWGFS
		Western English Channel	604	5 – 31	1 – 174	0.0188	2.6534	0.9574	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	806	5 – 31	1 – 173	0.0148	2.7707	0.9368	Q4SWIBTS
		Celtic Seas	124	7 – 16	3 – 21	0.0430	2.1697	0.7669	DCRDC
		North Sea	206	6 – 16	1 – 18	0.0474	2.1387	0.8298	IBTS3E
		Western English Channel	135	5 – 16	1 – 18	0.0136	2.5930	0.9201	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	565	4 – 18	1 – 51	0.0351	2.3248	0.8341	Q4SWIBTS
		Celtic Seas	782	17 – 32	29 – 228	0.0037	3.1991	0.9105	DCRDC
Scombridae	<i>Scomber scombrus</i> European mackerel	North Sea	1153	7 – 48	2 – 954	0.0052	3.1674	0.9360	IBTS3E
		Irish Sea and Celtic Seas (GOV)	293	15 – 38	20 – 576	0.0037	3.2265	0.9733	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Scophthalmidae	<i>Lepidorhombus whiffiagonis</i> Megrim	Celtic Seas	2349	6 – 58	2 – 1655	0.0059	3.0732	0.9884	DCRDC
		North Sea	294	15 – 55	22 – 1453	0.0022	3.3433	0.9864	IBTS3E
		Irish Sea and Celtic Seas (BT)	247	14 – 49	19 – 1086	0.0067	3.0359	0.9775	NWGFS
		Western English Channel	960	7 – 53	3 – 1542	0.0056	3.0738	0.9799	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	771	6 – 57	1 – 1943	0.0064	3.0467	0.9834	Q4SWIBTS
	<i>Lepidorhombus boscii</i> Four-spot megrim	Celtic Seas	13	23 – 31	98 – 287	0.0035	3.3009	0.9366	DCRDC
		Southern North Sea and Eastern English Channel	93	17 – 61	77 – 3085	0.0143	2.9904	0.9856	BTS7D
		Celtic Seas	23	28 – 56	319 – 2691	0.0072	3.1914	0.9647	DCRDC
		Irish Sea and Celtic Seas (BT)	125	16 – 55	60 – 2335	0.0195	2.9179	0.9756	NWGFS
		Western English Channel	67	21 – 64	133 – 3666	0.0139	3.0126	0.9758	Q1SWBEAM
Bothidae	<i>Scophthalmus rhombus</i> Brill	Irish Sea and Celtic Seas (GOV)	50	24 – 56	215 – 2420	0.0149	3.0059	0.9687	Q4SWIBTS
		Southern North Sea and Eastern English Channel	340	8 – 17	6 – 44	0.0368	2.4421	0.8853	BTS7D
		Celtic Seas	201	6 – 21	2 – 75	0.0094	2.9368	0.9049	DCRDC
		North Sea	170	7 – 15	2 – 23	0.0337	2.3526	0.7750	IBTS3E
		Irish Sea and Celtic Seas (BT)	882	3 – 17	1 – 44	0.0206	2.6800	0.8683	NWGFS
	<i>Arnoglossus laterna</i> Scaldfish	Western English Channel	511	6 – 17	1 – 40	0.0139	2.7989	0.7990	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	199	5 – 17	1 – 42	0.0179	2.6722	0.9028	Q4SWIBTS
		Celtic Seas	416	14 – 45	20 – 800	0.0020	3.3575	0.9777	DCRDC
		North Sea	68	11 – 50	6 – 1027	0.0017	3.3887	0.9776	IBTS3E
		Irish Sea and Celtic Seas (BT)	207	12 – 37	9 – 337	0.0035	3.2079	0.9626	NWGFS
Pleuronectidae	<i>Glyptocephalus cynoglossus</i> Witch	Western English Channel	32	15 – 40	21 – 427	0.0019	3.3496	0.9798	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	114	4 – 45	1 – 699	0.0050	3.0788	0.9679	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
	<i>Hippoglossoides platessoides</i> Long-rough dab	Celtic Seas	665	4 – 27	1 – 187	0.0130	2.8068	0.9483	DCRDC
		North Sea	966	5 – 30	1 – 259	0.0053	3.1434	0.9609	IBTS3E
		Irish Sea and Celtic Seas (BT)	119	5 – 20	1 – 76	0.0080	3.0086	0.9599	NWGFS
		Irish Sea and Celtic Seas (GOV)	938	4 – 26	1 – 158	0.0114	2.8774	0.9322	Q4SWIBTS
		North Sea	7	54 – 79	1468 – 5495	0.0023	3.3796	0.9615	IBTS3E
	<i>Hippoglossus hippoglossus</i> Halibut	Southern North Sea and Eastern English Channel	1526	2 – 33	1 – 375	0.0211	2.7928	0.9839	BTS7D
		Celtic Seas	669	6 – 32	2 – 407	0.0133	2.9059	0.9481	DCRDC
		North Sea	1224	4 – 35	1 – 459	0.0159	2.8639	0.9831	IBTS3E
		Irish Sea and Celtic Seas (BT)	1412	3 – 33	1 – 366	0.0160	2.8756	0.9808	NWGFS
		Western English Channel	574	7 – 32	2 – 374	0.0084	3.0675	0.9848	Q1SWBEAM
	<i>Microstomus kitt</i> Lemon sole	Irish Sea and Celtic Seas (GOV)	905	4 – 33	1 – 392	0.0199	2.8005	0.9829	Q4SWIBTS
		Southern North Sea and Eastern English Channel	570	4 – 35	1 – 644	0.0092	3.1233	0.9911	BTS7D
		Celtic Seas	828	11 – 37	15 – 796	0.0070	3.1628	0.9758	DCRDC
		North Sea	686	6 – 42	3 – 891	0.0123	2.9713	0.9759	IBTS3E
		Irish Sea and Celtic Seas (BT)	470	5 – 35	1 – 510	0.0111	3.0414	0.9851	NWGFS
		Western English Channel	696	14 – 42	32 – 1043	0.0063	3.2016	0.9588	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	503	12 – 40	19 – 788	0.0098	3.0681	0.9701	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
Soleidae	<i>Pleuronectes platessa</i> European plaice	Southern North Sea and Eastern English Channel	3559	4 – 64	1 – 3159	0.0156	2.8833	0.9863	BTS7D
		Celtic Seas	1039	9 – 63	8 – 2247	0.0110	2.9578	0.9776	DCRDC
		North Sea	3029	10 – 57	10 – 1902	0.0125	2.9425	0.9780	IBTS3E
		Irish Sea and Celtic Seas (BT)	5416	6 – 51	3 – 1430	0.0167	2.8631	0.9792	NWGFS
		Western English Channel	1634	12 – 60	17 – 2204	0.0114	2.9564	0.9645	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	2118	5 – 52	2 – 1795	0.0101	3.0196	0.9805	Q4SWIBTS
	<i>Buglossidium luteum</i> Solenette	Southern North Sea and Eastern English Channel	702	5 – 13	2 – 32	0.0280	2.6738	0.8610	BTS7D
		Celtic Seas	191	7 – 17	4 – 74	0.0101	3.0679	0.9588	DCRDC
		North Sea	289	5 – 12.5	1 – 22	0.0145	2.8722	0.8437	IBTS3E
		Irish Sea and Celtic Seas (BT)	1089	4 – 13	1 – 46	0.0255	2.6917	0.7792	NWGFS
		Western English Channel	573	6 – 16	2 – 57	0.0058	3.3081	0.8700	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	388	7 – 13	4 – 53	0.0108	3.1309	0.6036	Q4SWIBTS
<i>Microchirus variegatus</i> Thickback sole		Southern North Sea and Eastern English Channel	112	7 – 19	5 – 88	0.0285	2.7116	0.9531	BTS7D
		Celtic Seas	699	7 – 20	5 – 97	0.0146	2.9326	0.9284	DCRDC
		Irish Sea and Celtic Seas (BT)	861	4 – 21	1 – 102	0.0208	2.8221	0.9348	NWGFS
		Western English Channel	671	5 – 20	2 – 99	0.0142	2.9536	0.9375	Q1SWBEAM
		Irish Sea and Celtic Seas (GOV)	538	6 – 20	3 – 91	0.0167	2.8862	0.9257	Q4SWIBTS

continued

Table 4: continued

Family	Scientific name		Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Survey
	Common name									
	<i>Solea solea</i> Sole		Southern North Sea and Eastern English Channel	2873	3 – 45	1 – 773	0.0112	2.9354	0.9826	BTS7D
			Celtic Seas	807	9 – 49	7 – 1430	0.0044	3.2285	0.9829	DCRDC
			North Sea	134	7 – 37	3 – 519	0.0089	3.0172	0.9734	IBTS3E
			Irish Sea and Celtic Seas (BT)	2188	6 – 50	1 – 1336	0.0077	3.0717	0.9783	NWGFS
			Western English Channel	997	16 – 52	35 – 1612	0.0044	3.2293	0.9706	Q1SWBEAM
			Irish Sea and Celtic Seas (GOV)	256	10 – 49	6 – 1270	0.0056	3.1786	0.9807	Q4SWIBTS

Table 5: Parameters for the length–weight relationships for those fish species that may occur on the continental shelf of the British Isles. Species list adapted from Wheeler (1992) and Wheeler *et al.* (2004). The higher taxonomic order follows Eschemeyer (2013). Length and weight ranges are given in cm and g, unless otherwise specified. Length–weight relationships were taken from north–western Europe where possible, but data from other areas included for those species that are infrequent around the British Isles. Data are generally for sexes combined, although it should be noted that length–weight relationships can differ between males and females.

Family	Scientific name		Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
	Common name				Length range (cm)						
Myxiniidae	<i>Myxine glutinosa</i> Hagfish		British Isles	59	L _T	19–43	10–110	0.0167	2.2466	0.7724	This study
Petromyzonidae	<i>Petromyzon marinus</i> Sea lamprey		Scotland	25	L _T	31.5–93	41–1310	0.0008	3.1956	–	Coull <i>et al.</i> (1989)
	<i>Lampetra fluviatilis</i> River lamprey		–	–	–	–	–	–	–	–	Further studies required
Chimaeridae	<i>Chimaera monstrosa</i> Rabbit fish		Portugal	22	L _T	31.6–93.3	28.5–1184.8	0.00014	3.475	0.94	Borges <i>et al.</i> (2003)
			Spain	386	L _{PSC}	9.5–58.1	6–1735	0.0076	3.066	0.99	Torres <i>et al.</i> (2012)
Chlamydoselachidae	<i>Chlamydoselachus anguineus</i> Frisled shark		Atlantic	32	L _T	122–153	3920–8860	0.045	2.3704	0.4256	Adapted from Kukuev & Pavlov (2008)
Hexanchidae	<i>Heptanchias perlo</i> Seven-gilled shark		Turkey	11	L _T	31.1–105.3	80.2–3560	0.0021	3.08	0.998	Güven <i>et al.</i> (2012)
	<i>Hexanchus griseus</i> Six-gilled shark		Turkey	7	L _T	80–170	1650–22850	0.0002	3.606	0.982	Ismen <i>et al.</i> (2009)
Cetorhinidae	<i>Cetorhinus maximus</i> Basking shark		–	–	–	–	–	–	–	–	Further studies required
Lamnidae	<i>Isurus oxyrinchus</i> Shortfin mako		Portugal	221	L _F	64–290	(kg)	0.0000244	2.8289	0.9718	Maia <i>et al.</i> (2007)
	<i>Lamna nasus</i> Porbeagle shark		NE Atlantic	1020	L _F	88–249	–	0.04	2.7767	–	Hennache & Jung (2010)
Alopiidae	<i>Alopias superciliosus</i> Big-eye thresher shark		NW Atlantic	55	L _F	100–228	11–170 kg	9.1069 x 10 ⁻⁶	3.0802	0.9059	Kohler <i>et al.</i> (1996)
	<i>Alopias vulpinus</i> Thresher shark		NW Atlantic	88	L _F	154–262	54–211 kg	1.8821 x 10 ⁻⁴	2.5188	0.8795	Kohler <i>et al.</i> (1996)
Scylliorhinidae	<i>Galeus melastomus</i> Black-mouth dogfish		British Isles	14	L _T	17–61	12–659	0.0023	3.0632	0.9895	This study
			Portugal	311	L _T	11.1–66.1	3.4–881.8	0.00166	3.145	0.98	Borges <i>et al.</i> (2003)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Triakidae	<i>Scyliorhinus canicula</i> Lesser-spotted dogfish	British Isles	5673	L _T	8–76	3–1487	0.0022	3.1194	0.9803	This study
	<i>Scyliorhinus stellaris</i> Greater-spotted dogfish	British Isles	163	L _T	17–107	25–6340	0.0045	3.0155	0.9878	This study
	<i>Galeorhinus galeus</i> Tope	British Isles	43	L _T	39–155	270–17100	0.0038	3.0331	0.9944	This study
	<i>Mustelus</i> spp. Smooth-hound	British Isles	702	L _T	22–113	36–6930	0.0030	3.0349	0.9926	This study
	<i>Mustelus asterias</i> Starry smooth-hound	Adriatic	67	L _T	19.1–117.3	120.4–8750	0.0020	3.079	0.979	Pallaoro <i>et al.</i> (2005)
Caracharhinidae	<i>Mustelus mustelus</i> Common smooth-hound	Turkey	70	L _T	46.8–152.2	382–14431	0.0034	2.9789	0.988	Ismen <i>et al.</i> (2009)
	<i>Prionace glauca</i> Blue shark	NW Atlantic	4529	L _F	52–288	1–174 kg	3.1841 × 10 ⁻⁶	3.1313	0.9521	Kohler <i>et al.</i> (1996)
	<i>Sphyrna zygaena</i> Smooth hammerhead	South Africa	–	L _T	≤350	(kg)	1.42 × 10 ⁻⁶	3.30	–	Torres (1991)
Dalatiidae	<i>Dalatias licha</i> Kitefin shark	Azores	224 (F) 50 (M)	L _T	125–161 102–126	15.5–19.1 kg 6.65–10.25 kg	1.50 × 10 ⁻⁴ 5.13 × 10 ⁻⁵	2.35 2.52	– –	ICES (1997)
	<i>Etmopterus spinax</i> Velvet belly	Spain	277	L _T	9.9–36.1	3.4–223.0	0.0036	3.063	0.99	Torres <i>et al.</i> (2012)
Somniosidae	<i>Somniosus microcephalus</i> Greenland shark	Svalbard	32	L _T	245–389	–	0.000005	3.13	0.89	MacNeil <i>et al.</i> (2012)
Oxynotidae	<i>Oxynotus centrina</i> Angular rough shark	–	–	–	–	–	–	–	–	Further studies required
	<i>Oxynotus paradoxus</i> Sailfin rough shark	–	–	–	–	–	–	–	–	Further studies required
	<i>Squalus acanthias</i> Spurdog	British Isles	345	L _T	20–116	28–8600	0.0017	3.2080	0.9858	This study

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Echinorhinidae	<i>Echinorhinus brucus</i> Bramble shark	–	–	–	–	–	–	–	–	Further studies required
Squatinae	<i>Squatina squatina</i> Angel shark	Scotland	8	L _T	68.5–136.5	2914–20000	0.0346	2.7079	–	Coull <i>et al.</i> (1989)
Torpedinidae	<i>Torpedo nobiliana</i> Common electric ray	Scotland	8	L _T	20–83.5	277–25855	0.0672	2.9256	–	Coull <i>et al.</i> (1989)
Rajidae	<i>Torpedo marmorata</i> Marbled electric ray	British Isles	17	L _T	15–49	101–2755	0.0400	2.8568	0.9915	This study
	<i>Amblyraja radiata</i> Starry ray	British Isles	448	L _T	8–51	4–1104	0.0107	2.9400	0.9755	This study
	<i>Dipturus batis</i> -complex Common skate	British Isles	46	L _T	19–131	36–13940	0.0038	3.1201	0.9957	This study
	<i>Dipturus oxyrinchus</i> Long-nose skate	Portugal	8	L _T	30.2–55.4	88.0–702.7	0.00048	3.539	0.99	Borges <i>et al.</i> (2003)
	<i>Leucoraja circularis</i> Sandy ray	–	–	–	–	–	–	–	–	Further studies required
	<i>Leucoraja fullonica</i> Shagreen ray	British Isles	15	L _T	20–60	36–1115	0.0033	3.0980	0.9774	This study
	<i>Leucoraja naevus</i> Cuckoo ray	British Isles	619	L _T	11–72	6–2465	0.0036	3.1399	0.9913	This study
	<i>Raja brachyura</i> Blonde ray	British Isles	352	L _T	13–108	11–11940	0.0027	3.2580	0.9888	This study
	<i>Raja clavata</i> Thornback ray	British Isles	2417	L _T	10–94	6–6170	0.0045	3.0961	0.9921	This study
	<i>Raja microcellata</i> Small-eyed ray	British Isles	396	L _T	12–89	12–5780	0.0030	3.2250	0.9903	This study
	<i>Raja montagui</i> Spotted ray	British Isles	1695	L _T	10–69	7–2483	0.0041	3.1152	0.9889	This study

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
	<i>Raja undulata</i> Undulate ray	British Isles	99	L _T	19–95	42–7860	0.0040	3.1346	0.9912	This study
	<i>Rajella fyllae</i> Round skate	–	–	–	–	–	–	–	–	Further studies required
	<i>Rostoraja alba</i> White skate	Turkey	126	L _T	14.0–159.0	7.93–33000	0.00194	3.27	0.980	Yiğın & Ismen (2009)
Dasyatidae	<i>Dasyatis pastinaca</i> Common stingray	Turkey	29	L _T	37.3–74.2	333.23–2955	0.0149	2.81	0.85	Filiz & Bilge (2004)
	<i>Pteroplatytrygon violacea</i> Pelagic stingray	SW Atlantic	157	D _w	36.5–68.5	1082–7780	0.0273	2.9518	0.8788	Ribeiro-Prado & Amorim (2008)
Myliobatidae	<i>Myliobatis aquila</i> Eagle ray	Scotland	12	L _T	27.5–58.5	612–3690	0.2902	2.2621	–	Coull <i>et al.</i> (1989)
Acipenseridae	<i>Acipenser sturio</i> Sturgeon	Scotland	72	L _T	75.5–352.5	4.8–317.5 kg	0.0155	2.8230	–	Coull <i>et al.</i> (1989)
Megalopidae	<i>Megalops atlanticus</i> Tarpon	West Atlantic	1262	L _F	102–2045 mm	–	1.2145 × 10 ⁻⁸	2.9838	0.997	Crabtree <i>et al.</i> (1995)
Notacanthidae	<i>Notacanthus chemnitzii</i> Spiny-eel	NW Atlantic	23	L _T	–	–	0.000466	3.39	0.99	Vásquez (1989)
Anguillidae	<i>Anguilla anguilla</i> European eel	UK (E&W) rivers	5237	L _T	6.5–84.7	0.14–1270.0	0.000730	3.249	0.9881	A.M. Walker & D.L. Maxwell pers. comm.
Muraenidae	<i>Muraena helena</i> Moray eel	Portugal	107	L _T	17–68.6	–	0.0010	3.16	0.985	Veiga <i>et al.</i> (2009)
		Madeira	24	L _T	71–126	–	0.00048	3.322	0.948	Ferreira <i>et al.</i> (2008)
Congridae	<i>Conger conger</i> European conger eel	British Isles	113	L _T	34–165	46–17920	0.0002	3.5789	0.9824	This study
Clupeidae	<i>Alosa alosa</i> Allis shad	Scotland	42	L _T	31.5–64.5	260–2340	0.0096	2.9810	–	Coull <i>et al.</i> (1989)
	<i>Alosa fallax</i> Twaité shad	Scotland	80	L _T	27.5–50.5	167–1335	0.0013	3.5448	–	Coull <i>et al.</i> (1989)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
				Length range (cm)						
Engraulidae	<i>Clupea harengus</i> Herring	British Isles	5008	L _T	7–35.5	2–477	0.0026	3.3687	0.9716	This study
	<i>Sprattus sprattus</i> Sprat	British Isles	2701	L _T	4.5–15.5	1–36	0.0088	2.9193	0.8108	This study
	<i>Sardina pilchardus</i> Pilchard	British Isles	1029	L _T	9–27.5	4–181	0.0053	3.1619	0.9730	This study
	<i>Engraulis encrasicolus</i> European anchovy	British Isles	657	L _T	7.5–22	1–69	0.0050	3.1072	0.8737	This study
Argentinidae	<i>Argentina</i> spp. Argentine	British Isles	1731	L _T	4–25	0.6–97	0.0058	3.0308	0.9636	This study
	<i>Argentina silus</i> Greater silver smelt	Scotland	168	L _T	18.5–42.5	16–568	0.0039	3.2027	–	Coull <i>et al.</i> (1989)
	<i>Argentina sphyraena</i> Lesser silver smelt	Scotland	157	L _T	15.5–25.5	21–110	0.0053	3.0534	–	Coull <i>et al.</i> (1989)
Osmeridae	<i>Osmerus eperlanus</i> Smelt	Netherlands	996	L _T	–	(kg)	2.30 × 10 ⁻⁶	3.37	0.98	Mous (2000)
Salmonidae	<i>Salmo salar</i> Atlantic salmon	NE England	6138	L _F	41–111	650–11680	0.0274	2.7802	0.876	I.C. Russell & E.C.E. Potter pers. comm.
	<i>Salmo trutta</i> Sea trout	British Isles	7070	L _F	18–90	70–8250	0.0142	2.9557	0.9736	I.C. Russell & E.C.E. Potter pers. comm.
Sternoptychidae	<i>Mauroliscus muelleri</i> Pearlside	British Isles	100	L _T	2–10	1–10	0.1149	1.6065	0.6441	This study
Paralepididae	<i>Paralepis coregonoides</i> Barracudina	–	–	–	–	–	–	–	–	Further studies required
Alepisauridae	<i>Alepisaurus ferox</i> Lancetfish	SW Atlantic	60	L _F	50–127	(guttred weight)	0.0005233	3.1310	0.92	Vaske Junior <i>et al.</i> (1998)
Gadidae	<i>Gadiculus argenteus</i> Silvery pout	British Isles	872	L _T	4–15	1–32	0.0160	2.7931	0.7997	This study

continued

Table 5: continued

Family	Scientific name		Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
	Common name				Length range (cm)						
Lotidae	<i>Gadus morhua</i> Cod		British Isles	2073	L _T	8–119	4–19360	0.0098	3.0109	0.9952	This study
	<i>Melanogrammus aeglefinus</i> Haddock		British Isles	6823	L _T	9–82	7–5645	0.0083	3.0473	0.9868	This study
	<i>Merlangius merlangus</i> Whiting		British Isles	7880	L _T	4.7–62	1–1998	0.0082	3.0059	0.9843	This study
	<i>Micromesistius poutassou</i> Blue whiting		British Isles	2772	L _T	11–41	6–476	0.0047	3.1074	0.9344	This study
	<i>Pollachius pollachius</i> Pollack		British Isles	50	L _T	28–73	212–4436	0.0076	3.0686	0.9594	This study
	<i>Pollachius virens</i> Saithe		British Isles	710	L _T	23–113	103–12200	0.0085	3.0242	0.9837	This study
	<i>Trisopterus esmarki</i> Norway pout		British Isles	3155	L _T	6–25	1–115	0.0082	2.9981	0.9351	This study
	<i>Trisopterus luscus</i> Bib		British Isles	1688	L _T	3–46	1–1224	0.0151	2.9459	0.9899	This study
	<i>Trisopterus minutus</i> Poor cod		British Isles	6255	L _T	4–26	1–206	0.0117	2.9452	0.9597	This study
	<i>Raniceps raninus</i> Tadpole fish		Scotland	21	L _T	13.5–30.5	24–465	0.0062	3.2667	–	Coull <i>et al.</i> (1989)
	<i>Brosme brosme</i> Tusk		British Isles	7	L _T	ca. 43–71.5	ca. 854–4445	0.00514	3.189	–	Bedford <i>et al.</i> (1986)
	<i>Ciliata mustela</i> Five-bearded rockling		British Isles	87	L _T	4.6–21	0.6–71	0.0052	3.1504	0.9492	This study
	<i>Ciliata septentrionalis</i> Northern rockling		British Isles	18	L _T	7–17	3–40	0.0092	2.9846	0.9437	This study
	<i>Gaidropsarus macrophthalmus</i> Bigeye rockling		Spain	30	L _T	10–19	5.7–37.6	0.00634	2.9502	0.956	Pereda & Villamor (1991)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
	<i>Gaidropsarus mediterraneus</i> Shore rockling	British Isles	11	L _T	5–11	1–12	0.0133	2.8387	0.8246	This study
	<i>Gaidropsarus vulgaris</i> Three-bearded rockling	British Isles	67	L _T	5–40	1–594	0.0051	3.1481	0.9893	This study
	<i>Enchelyopus cimbrius</i> Four-bearded rockling	British Isles	334	L _T	6–31	1–166	0.0080	2.8377	0.9662	This study
	<i>Molva dipterygia</i> Blue ling	British Isles	53	L _T	69–142	–	0.00191	3.14882	0.98956	Dorel (1986)
	<i>Molva molva</i> Common ling	British Isles	182	L _T	21–136	40–14800	0.0036	3.1080	0.9903	This study
Phycidae	<i>Phycis blennoides</i> Greater forkbeard	British Isles	51	L _T	9–52	5–1353	0.0051	3.1469	0.9858	This study
Merlucciidae	<i>Merluccius merluccius</i> European hake	British Isles	2811	L _T	5–109	1–9600	0.0060	3.0363	0.9927	This study
Macrouridae	<i>Coelacanthus caelacanthus</i> Hollow-snout rat-tail	Portugal	25	L _T	8.6–22.0	2.6–30.8	0.00219	3.106	0.93	Borges <i>et al.</i> (2003)
Moridae	<i>Lepidion eques</i> North Atlantic codling	Spain	34	L _T	8–27	2–102	0.0018	3.3073	0.99	Pérez & Contreras (1995)
Carapidae	<i>Echiodon drummondii</i> Pearlfish	–	–	–	–	–	–	–	–	Further studies required
Lophiidae	<i>Lophius budegassa</i> Black-bellied anglerfish	British Isles	285	L _T	10–81	18–7500	0.0259	2.8575	0.9810	This study
	<i>Lophius piscatorius</i> Anglerfish	British Isles	2101	L _T	5–111	4–24060	0.0266	2.8614	0.9805	This study
Gobiesocidae	<i>Apletodon dentatus</i> Small-headed clingfish	–	–	–	–	–	–	–	–	Further studies required
	<i>Diplecogaster bimaculata</i> Two-spotted clingfish	British Isles	54	L _T	0.8–4.4	0.1–1.1	0.0589	1.8205	0.5847	This study

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Weight range (g)	a	b	r ²	Source
	<i>Lepadogaster candolli</i> Connemarra clingfish	–	–	–	–	–	–	–	Further studies required
	<i>Lepadogaster purpurea</i> Shore clingfish	Ireland	128	L _T 16–68 mm	(mg)	0.013	3.06	0.9409	King (1989)
Exocoetidae	<i>Cheilopogon heterurus</i> Atlantic flying fish	–	–	–	–	–	–	–	Further studies required
Belonidae	<i>Belone belone</i> Garfish	Scotland	20	L _T 30.5–76.5	24–609	0.0002	3.4420	–	Coull <i>et al.</i> (1989)
	<i>Belone svetovidovi</i> Short-beaked garfish	–	–	–	–	–	–	–	Further studies required
Scomberesocidae	<i>Scomberesox saurus</i> Saury pike	Scotland	22	L _T 17–40.5	13–233	0.0015	3.1934	–	Coull <i>et al.</i> (1989)
Atherinidae	<i>Atherina boyeri</i> Big-scale sandsmelt	Adriatic	710	L _T 4.5–15.7	–	0.0075	2.975	0.98	Dulčić & Glamuzina (2006)
	<i>Atherina presbyter</i> Sand smelt	Portugal	2829	L _T 3.0–12.2	–	0.0064	3.05	0.969	Veiga <i>et al.</i> (2009)
Lampridae	<i>Lampris guttatus</i> Opah	Scotland	13	L _T 77–136.5	20900–63500	9.9444	1.7915	–	Coull <i>et al.</i> (1989)
Trachipteridae	<i>Trachipterus arcticus</i> Deal-fish	Scotland	18	L _T 111.5–218	1500–20000	0.00003	3.8213	–	Coull <i>et al.</i> (1989)
Regalecidae	<i>Regalecus glesne</i> Oar-fish	–	–	–	–	–	–	–	Further studies required
Berycidae	<i>Beryx decadactylus</i> Alfonsino	Madeira	45	L _F 24–53	–	0.02899	2.941	0.972	Ferreira <i>et al.</i> (2008)
	<i>Beryx splendens</i> Beryx	Madeira	160	L _F 16–40	–	0.02189	3.026	0.975	Ferreira <i>et al.</i> (2008)
Zeidae	<i>Cyttopsis rosea</i> Red dory	–	–	–	–	–	–	–	Further studies required

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
	<i>Zenopsis conchifer</i> Sailfin dory	Portugal	15	L _T	13.4–22.9	31.9–168.5	0.01621	2.950	0.96	Borges <i>et al.</i> (2003)
		Spain	29	L _T	7.9–51.3	10.2–1642.0	0.0345	2.723	1.00	Torres <i>et al.</i> (2012)
	<i>Zeus faber</i> John dory	British Isles	724	L _T	3–56	1–3593	0.0399	2.7536	0.9872	This study
Caproidae	<i>Capros aper</i> Boarfish	British Isles	979	L _T	1.9–20	0.1–170	0.0549	2.6322	0.9630	This study
Gasterosteidae	<i>Gasterosteus aculeatus</i> Three-spined stickleback	Flanders	29213	L _T	1.5–10.0	–	0.0105	3.049	0.90	Verreycken <i>et al.</i> (2011)
	<i>Spinachia spinachia</i> Sea stickleback	Scotland	28	L _T	7.6–14.7	–	0.0007	3.49	0.92	Carss (1993)
Macroramphosidae	<i>Macroramphosus scolopax</i> Snipe-fish	Spain	179	L _T	5.2–16.1	0.6–27.8	0.0032	3.237	0.95	Torres <i>et al.</i> (2012)
Syngnathidae	<i>Entelurus aequoreus</i> Snake pipefish	British Isles	13	L _T	16–44	1–15	0.0008	2.5939	0.8202	This study
	<i>Nerophis lumbriciformis</i> Worm pipefish	–	–	–	–	–	–	–	–	Further studies required
	<i>Nerophis ophidion</i> Straight-nosed pipefish	Turkey	86	L _T	78–214 mm	0.06–0.83	0.0001	2.42	0.74	Gurkan & Taşkavak (2007)
	<i>Syngnathus</i> spp. Pipefish	British Isles	192	L _T	8–47	0.8–57	0.0014	2.7128	0.9439	This study
	<i>Syngnathus acus</i> Great pipefish	Spain	225	L _S	11–29.3 (L _T)	–	0.00072	2.8831	0.958	Valle <i>et al.</i> (2003)
	<i>Syngnathus rostellatus</i> Nilsson's pipefish	–	–	–	–	–	–	–	–	Further studies required
	<i>Syngnathus typhle</i> Deep-snouted pipefish	Spain	167	L _S	9.7–28.1 (L _T)	–	0.00024	3.1724	0.959	Valle <i>et al.</i> (2003)
	<i>Hippocampus hippocampus</i> Short-snouted sea horse	Tunisia	236	L _T	74–156 mm	1.43–18.7	3.39 x 10 ⁻⁶	3.069	0.84	Ben Amor <i>et al.</i> (2011)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
	<i>Hippocampus ramulosus</i> Sea horse	Tunisia	1773	L _T	63–176mm	1.17–24.3	4.44 x 10 ⁻⁶	3.013	0.85	Ben Amor <i>et al.</i> (2011)
Dactylopteridae	<i>Dactylopterus volitans</i> Flying gurnard	Mediterranean	27	L _T	26.7–48.6	181–880	0.0153	2.8633	0.962	Morey <i>et al.</i> (2003)
Scorpaenidae	<i>Helicolenus dactylopterus</i> Blue-mouth redfish	Spain	108	L _T	3.2–38.6	0.4–940.0	0.0113	3.128	0.99	Torres <i>et al.</i> (2012)
	<i>Scorpaena porcus</i> Black scorpion fish	Mediterranean	320	L _S	2.2–27 (L _T)	–	0.01667	3.0179	0.986	Valle <i>et al.</i> (2003)
	<i>Scorpaena scrofa</i> Red scorpion fish	Adriatic	125	L _T	19.7–53.6	90–3170	0.0061	3.298	0.96	Dulčić & Kraljevic (1996 & 1997)
	<i>Sebastes</i> spp. Redfish	British Isles	44	L _T	14–30	39–427	0.0178	2.9724	0.9708	This study
	<i>Sebastes norvegicus</i> Norway haddock	–	–	–	–	–	–	–	–	Further studies required
	<i>Sebastes viviparus</i> Redfish	Scotland	358	L _T	9–31	11–561	0.0115	3.1369	–	Coull <i>et al.</i> (1989)
Triglidae	<i>Aspitrigla cuculus</i> Red gurnard	British Isles	2155	L _T	7–45	5–887	0.0089	3.0257	0.9840	This study
	<i>Aspitrigla obscura</i> Long-finned gurnard	Portugal	45	L _T	9.6–25.3	5.9–137.9	0.005	3.15	0.98	Olim & Borges (2006)
	<i>Eutrigla gurnardus</i> Grey gurnard	British Isles	4686	L _T	3.7–41	1–685	0.0091	2.9772	0.9704	This study
	<i>Trigla lucerna</i> Tub gurnard	British Isles	1207	L _T	4–63	1–3264	0.0106	2.9846	0.9882	This study
	<i>Trigla lyra</i> Piper	Portugal	40	L _T	7.0–24.0	2.9–112.1	0.005	3.17	0.95	Olim & Borges (2006)
	<i>Trigloporus lastoviza</i> Streaked gurnard	British Isles	493	L _T	7–39	5–688	0.0170	2.8685	0.9827	This study

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Peristediidae	<i>Peristedion cataphractum</i> Armed gurnard	Spain	24	L _T	7.1–27.3	2.4–106.0	0.0082	2.855	0.98	Torres <i>et al.</i> (2012)
Cottidae	<i>Micrenophrys liljeborgi</i> Norway bullhead	–	–	–	–	–	–	–	–	Further studies required
	<i>Myoxocephalus scorpius</i> Bullrout	British Isles	253	L _T	4–29	1–426	0.0273	2.8524	0.9767	This study
	<i>Taurulus bubalis</i> Sea scorpion	British Isles	38	L _T	3.7–17	0.9–115	0.0161	3.0785	0.9810	This study
	<i>Triglops murrayi</i> Moustache sculpin	–	–	–	–	–	–	–	–	Further studies required
Agonidae	<i>Agonus cataphractus</i> Pogge	British Isles	2200	L _T	3–16	0.8–40	0.0232	2.5916	0.8736	This study
Cyclopteridae	<i>Cyclopterus lumpus</i> Lumpsucker	British Isles	12	L _T	4–34	3–2452	0.0880	2.8751	0.9624	This study
Liparidae	<i>Liparis</i> spp. Sea snail	British Isles	88	L _T	3–9	0.9–10	0.0405	2.4523	0.7834	This study
	<i>Liparis liparis</i> Sea snail	–	–	–	–	–	–	–	–	Further studies required
	<i>Liparis montagui</i> Montagu's sea snail	–	–	–	–	–	–	–	–	Further studies required
Moronidae	<i>Dicentrarchus labrax</i> European seabass	British Isles	128	L _T	30–76	267–4890	0.0103	3.0047	0.9778	This study
	<i>Dicentrarchus punctatus</i> Spotted seabass	Portugal	22	L _T	350–510 mm	–	0.00000064	3.440	0.96	Gonçalves <i>et al.</i> (1997)
Polyprionidae	<i>Polyprion americanus</i> Wreck-fish	Madeira	20	L _T	59–84	–	0.05286	2.737	0.944	Ferreira <i>et al.</i> (2008)
Serranidae	<i>Epinephelus marginatus</i> Dusky perch	Mediterranean	222	L _T	13.4–105.6	42.1–22290	0.0104	3.121	0.995	Morey <i>et al.</i> (2003)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
				Length range (cm)	Length range (cm)					
Apogonidae	<i>Serranus cabrilla</i> Comber	Mediterranean	208	L _S	4.6–15.6 (L _T)	–	0.01661	2.8246	0.982	Valle <i>et al.</i> (2003)
	<i>Epigonus telescopus</i> Bulls-eye	Azores	26	L _F	32.0–67.0	593–4990	0.0289	2.853	0.977	Rosa <i>et al.</i> (2006)
	<i>Pomatomus saltatrix</i> Blue fish	Adriatic	59	L _T	39.2–58.5	–	0.0076	3.055	0.977	Dulčić & Glamuzina (2006)
Echeneidae	<i>Remora remora</i> Remora	–	–	–	–	–	–	–	–	Further studies required
Coryphaenidae	<i>Coryphaena hippurus</i> Common dolphin fish	Barbados	365	L _F	160–1365 mm	–	1.45 × 10 ⁻⁵	2.91	–	Oxenford (1999)
Carangidae	<i>Caranx chrysos</i> Blue runner	Tunisia	189	L _T	11.4–34.9	–	0.0128	3.023	0.99	Ghailen <i>et al.</i> (2010)
	<i>Campogramma glaycos</i> Vadigo	–	–	–	–	–	–	–	–	Further studies required
	<i>Naucrates ductor</i> Pilot fish	Mediterranean	559	L _F	ca. 3–30	–	0.0147	3.040	0.99	Reñones <i>et al.</i> (1999)
	<i>Seriola carpenteri</i> Guinean amberjack	–	–	–	–	–	–	–	–	Further studies required
	<i>Seriola dumerili</i> Amberjack	Mediterranean	150	L _T	20.3–45.1	92.9–1031	0.0273	2.7438	0.97	Morey <i>et al.</i> (2003)
	<i>Seriola rivoliana</i> Almacojack	Azores	101	L _T	10.5–122.8	–	0.0108	3.058	0.984	Morato <i>et al.</i> (2001)
	<i>Trachinotus ovatus</i> Derbio	Azores	221	L _T	2.6–36.2	–	0.0122	2.832	0.988	Morato <i>et al.</i> (2001)
	<i>Trachurus trachurus</i> Horse mackerel	British Isles	3303	L _T	4–39	0.4–544	0.0105	2.9622	0.9669	This study
Bramidae	<i>Brama brama</i> Ray's bream	Scotland	11	L _T	35–61	374–2860	0.0011	3.6089	–	Coull <i>et al.</i> (1989)
		Portugal	234	L _T	32.4–55.8	332–2032	0.00511	3.185	–	Lobo & Erzini (2001)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Sparidae	<i>Pterycombus brama</i> Rough pomfret	-	-	-	-	-	-	-	-	Further studies required
	<i>Taractes asper</i> Rough/Silver pomfret	-	-	-	-	-	-	-	-	Further studies required
	<i>Taractichthys longipinnis</i> Long-finned bream	-	-	-	-	-	-	-	-	Further studies required
	<i>Boops boops</i> Bogue	Portugal	505	L _T	9.8–26.9	8.0–204.8	0.01208	2.892	0.90	Borges <i>et al.</i> (2003)
	<i>Dentex dentex</i> Dentex	Mediterranean	38	L _T	25.2–63.4	214–3446	0.0113	3.0349	0.991	Morey <i>et al.</i> (2003)
	<i>Diplodus cervinus</i> Zebra sea-bream	Portugal	51	L _T	160–500 mm	-	0.00000838	3.14	0.99	Gonçalves <i>et al.</i> (1997)
	<i>Diplodus sargus</i> White sea-bream	Spain	472	L _T	26.7–42.8	203.7–1403.0	0.0228	2.904	0.88	Torres <i>et al.</i> (2012)
	<i>Oblada melanura</i> Saddled sea-bream	Portugal	49	L _T	20.5–28.2	82.7–278.1	0.01605	2.906	0.93	Borges <i>et al.</i> (2003)
	<i>Pagellus acarne</i> Axillary sea-bream	Spain	414	L _T	12.3–34.5	20.0–606.0	0.0044	3.349	0.99	Torres <i>et al.</i> (2012)
	<i>Pagellus bogaraveo</i> Red sea-bream	Azores	3998	L _F	11–56	24–3006	0.0172	3.027	0.986	Rosa <i>et al.</i> (2006)
	<i>Pagellus erythrinus</i> Pandora	Spain	478	L _T	5.4–28.9	1.9–292.2	0.0111	3.035	0.99	Torres <i>et al.</i> (2012)
	<i>Pagrus pagrus</i> Couch's sea-bream	Mediterranean	127	L _T	4.8–33.4	2–551	0.0282	2.8003	0.956	Morey <i>et al.</i> (2003)
	<i>Sarpa salpa</i> Saupe	Portugal	46	L _T	22.6–43.0	168.5–1075.2	0.01068	3.087	0.99	Borges <i>et al.</i> (2003)
	<i>Sparus aurata</i> Gilthead sea-bream	Portugal	210	L _T	23.5–67.0	175–3910	0.0204	2.872	0.957	Santos <i>et al.</i> (2002)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
				Length	range (cm)					
Sciaenidae	<i>Spondylosoma cantharus</i> Black sea-bream	British Isles	217	L _T	5–42	3–1265	0.0148	3.0044	0.9849	This study
	<i>Argyrosomus regius</i> Meagre	Spain	66	L _T	13.9–63.0	79.6–2800	0.0333	2.676	0.94	Torres <i>et al.</i> (2012)
Mullidae	<i>Mullus surmuletus</i> Red mullet	British Isles	405	L _T	6–42	2–1069	0.0092	3.1048	0.9880	This study
Cepolidae	<i>Cepola rubescens</i> Red bandfish	British Isles	46	L _T	9–64	1–116	0.0177	2.1318	0.9043	This study
Mugilidae	<i>Chelon labrosus</i> Thick-lipped grey mullet	Adriatic	44	L _T	16.7–54.7	–	0.0029	3.350	0.982	Dulčić & Glamuzina (2006)
	<i>Liza aurata</i> Golden grey mullet	Portugal	20	L _T	20.1–40.5	45.6–576.7	0.00782	3.006	0.99	Borges <i>et al.</i> (2003)
Labridae	<i>Liza ramada</i> Thin-lipped grey mullet	Portugal	23	L _T	26.0–48.5	144.8–1068.0	0.00487	3.154	0.95	Borges <i>et al.</i> (2003)
	<i>Mugil cephalus</i> Flathead grey mullet	Adriatic	129	L _T	25.0–63.0	–	0.0049	3.171	0.987	Dulčić & Glamuzina (2006)
	<i>Acantholabrus palloni</i> Scale-rayed wrasse	Portugal	258	L _T	13.3–23.5	30–184	0.0108	3.071	0.866	Mendes <i>et al.</i> (2004)
	<i>Centrolabrus exoletus</i> Rock cook	Scotland	63	L _T	–	–	4.27 x 10 ⁻⁶	3.25	0.989	Sayer <i>et al.</i> (1996)
	<i>Coris julis</i> Rainbow wrasse	Mediterranean	323	L _S	3.3–17.1 (L _T)	–	0.00685	3.0311	0.992	Valle <i>et al.</i> (2003)
	<i>Symphodus bailloni</i> Bailon's wrasse	British Isles	66	L _T	9–41	14–1439	0.0138	3.0829	0.9729	This study
	<i>Symphodus melops</i> Corkwing wrasse	Portugal	19	L _T	4.5–18.0	–	0.0112	3.17	0.997	Veiga <i>et al.</i> (2009)
	<i>Ctenolabrus rupestris</i> Goldsinny wrasse	British Isles	273	L _T	8–15	6–60	0.0150	3.0403	0.9100	This study

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Zoaridae	<i>Labrus bergylta</i> Ballan wrasse	British Isles	93	L _T	6–46	3–2108	0.0127	3.1048	0.9896	This study
	<i>Labrus mixtus</i> Cuckoo wrasse	British Isles	129	L _T	10–39	11–1030	0.0069	3.2084	0.9764	This study
	<i>Zoarces viviparus</i> Eelpout	Gulf of Finland	248	L _T	–	–	0.010137	2.7826	0.85	Kristofferson & Oikari (1975)
	<i>Lycodes gracilis</i> Vahl's eelpout	–	–	–	–	–	–	–	–	Further studies required
Stichaeidae	<i>Chirolophis ascanii</i> Yarrell's blenny	–	–	–	–	–	–	–	–	Further studies required
Pholidae	<i>Lumpenus lampretaeformis</i> Snake blenny	British Isles	41	L _T	20–37	12–43	0.0342	1.9847	0.7029	This study
	<i>Pholis gunnellus</i> Butterfish	British Isles	34	L _T	5–20	0.6–30	0.0138	2.4873	0.8669	This study
	<i>Anarhichas denticulatus</i> Jellycat	Flemish Cap	66	L _T	41–121	790–27800	0.0173	2.9261	0.95	Paz & Román (1997)
Trachinidae	<i>Anarhichas lupus</i> Wolf-fish	British Isles	20	L _T	23–94	94–9250	0.0046	3.1849	0.9967	This study
	<i>Anarhichas minor</i> Spotted wolf-fish	Flemish Cap	236	L _T	13–110	20–1800	0.0053	3.1719	0.99	Paz & Román (1997)
	<i>Echichthys vipera</i> Lesser weever	British Isles	2002	L _T	5–18	1–79	0.0186	2.8398	0.8579	This study
Tripterygiidae	<i>Trachinus draco</i> Greater weever	British Isles	37	L _T	10–37.5	6–330	0.0087	2.9231	0.9935	This study
	<i>Tripterygion delaisi</i> Black-faced blenny	Turkey	7	L _T	2.8–5.6	–	0.00605	3.07	0.988	Ozen <i>et al.</i> (2009)
Blenniidae	<i>Blennius ocellaris</i> Butterfly blenny	British Isles	158	L _T	4–15	1–48	0.0257	2.7697	0.9203	This study

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Ammodytidae	<i>Coryphoblennius galerita</i> Montagu's blenny	–	–	–	–	–	–	–	–	Further studies required
	<i>Lipophrys pholis</i> Shanny	–	–	–	–	–	–	–	–	Further studies required
	<i>Parablennius gattorugine</i> Tompot blenny	British Isles	25	L _T	8–15	5–53	0.0066	3.2953	0.8448	This study
	<i>Parablennius ruber</i> Portuguese blenny	Azores	359	L _T	–	–	0.011	2.963	0.985	Azevedo & Homem (2002)
	<i>Ammodytes</i> spp. Sandeel	British Isles	98	L _T	6–31	1–79	0.0049	2.7826	0.9305	This study
	<i>Ammodytes marinus</i> Raitt's sandeel	North Sea	93	L _T	35–160 mm	–	2.7925 × 10 ⁻⁷	3.548	0.932	Robinson <i>et al.</i> (2010)
	<i>Ammodytes tobianus</i> Lesser sandeel	Portugal	25	L _T	8.9–14	–	0.0098	2.56	0.953	Veiga <i>et al.</i> (2009)
	<i>Gymnammodytes semisquamatus</i> Smooth sandeel	British Isles	12	L _T	16–31	17–60	0.0489	2.0911	0.9855	This study
	<i>Hyperoplus immaculatus</i> Corbin's sandeel	British Isles	166	L _T	7–33	1–109	0.0056	2.8225	0.9093	This study
	<i>Hyperoplus lanceolatus</i> Greater sandeel	British Isles	560	L _T	5–38	1–135	0.0087	2.6262	0.9669	This study
Callionymidae	<i>Callionymus lyra</i> Common dragonet	British Isles	4832	L _T	2–31	0.4–174	0.0210	2.6470	0.9450	This study
	<i>Callionymus maculatus</i> Spotted dragonet	British Isles	1041	L _T	4–18	1–51	0.0369	2.2653	0.8178	This study
	<i>Callionymus reticulatus</i> Reticulate dragonet	British Isles	141	L _T	4–15	1–14	0.0296	2.3367	0.8285	This study
Gobiidae	<i>Aphia minuta</i> Transparent goby	Portugal	124	L _T	2.7–6.9	–	0.0039	3.31	0.958	Veiga <i>et al.</i> (2009)

continued

Table 5: continued

Family	Scientific name		Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
	Common name				Length range (cm)						
	<i>Buenia jeffreysii</i> Jeffrey's goby		British Isles	33	L _T	3–6	0.1–3	0.0146	2.6867	0.5744	This study
	<i>Crystallogobius linearis</i> Crystal goby		Adriatic Sea	214	L _T	14–41 mm	8–245 mg	0.00149	3.24	0.95	La Mesa (2001)
	<i>Gobius cobitis</i> Giant goby		Adriatic	21	L _T	3.5–11.0	–	0.0123	3.050	0.977	Dulčić & Glamuzina (2006)
	<i>Gobius couchi</i> Couch's goby		Portugal	668	L _T	2.8–8.6	0.2–6.07	0.0104	3.00	0.969	Vieira <i>et al.</i> (2013)
	<i>Gobius cruentatus</i> Red-mouthed goby		Mediterranean	443	L _S	6.3–17.2 (L _T)	–	0.00807	3.1373	0.987	Valle <i>et al.</i> (2003)
	<i>Gobius gasteveni</i> Steven's goby		British Isles	11	L _T	7–10.4	3–12.3	0.0276	2.5680	0.5968	This study
	<i>Gobius niger</i> Black goby		British Isles	48	L _T	6–13	2–24	0.0056	3.3081	0.8924	This study
	<i>Gobius paganellus</i> Rock goby		British Isles	23	L _T	5–11	3–18	0.0506	2.3568	0.8717	This study
	<i>Gobiomacculus flavescens</i> Two-spot goby		–	–	–	–	–	–	–	–	Further studies required
	<i>Lebetus guilleleti</i> Guillet's goby		–	–	–	–	–	–	–	–	Further studies required
	<i>Lebetus scorpioides</i> Diminutive goby		–	–	–	–	–	–	–	–	Further studies required
	<i>Lesueurigobius friesii</i> Fries's goby		British Isles	37	L _T	6–10	2–8	0.0641	2.1122	0.6521	This study
	<i>Pomatoschistus</i> spp. Sand goby		British Isles	109	L _T	2.2–7	0.1–2.7	0.0066	3.0613	0.9028	This study
	<i>Pomatoschistus lozanoi</i> Lozano's goby		–	–	–	–	–	–	–	–	Further studies required

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
				Length	range (cm)					
	<i>Pomatoschistus microps</i> Common goby	Portugal	6458	L _T	1.5–5.8	–	0.0075	3.18	0.932	Veiga <i>et al.</i> (2009)
	<i>Pomatoschistus minutus</i> Sand goby	Portugal	7025	L _T	1.3–6.6	–	0.0076	3.14	0.945	Veiga <i>et al.</i> (2009)
	<i>Pomatoschistus norvegicus</i> Norwegian goby	North Sea	153	L _T	20–69.5 mm	–	1.028 × 10 ⁻⁵	2.919	0.903	Robinson <i>et al.</i> (2010)
	<i>Pomatoschistus pictus</i> Painted goby	Portugal	94	L _T	1.8–4.0	–	0.0069	3.19	0.922	Veiga <i>et al.</i> (2009)
Sphyracidae	<i>Thorogobius ephippiatus</i> Leopard-spotted goby	–	–	–	–	–	–	–	–	Further studies required
	<i>Sphyaena viridensis</i> Yellow barracuda	Azores	125	L _T	19.7–119.0	–	0.0036	3.016	0.975	Morato <i>et al.</i> (2001)
	<i>Aphanopus carbo</i> Black scabbardfish	Portugal	1042	L _T	66–132	(kg)	0.000376	3.27	0.702	Martins <i>et al.</i> (1989)
Trichiuridae	<i>Lepidopus caudatus</i> Silver scabbardfish	Spain	243	L _T	18.3–75.0	3.8–334.2	0.0003	3.230	0.98	Torres <i>et al.</i> (2012)
	<i>Trichiurus lepturus</i> Hairtail	Turkey	84	L _T	20.5–58.8	14.19–167.95	0.0083	2.334	0.73	Sangun <i>et al.</i> (2007)
Scombridae	<i>Auxis rochei</i> Frigate mackerel	Portugal	787	L _F	35–51	560–1680	0.0187	2.907	0.881	Santos <i>et al.</i> (2002)
	<i>Euthynnus alletteratus</i> Little tunny	Tunisia	346	L _F	19.2–97.8	–	0.0194	2.941	0.99	Ghailen <i>et al.</i> (2010)
	<i>Katsuwonus pelamis</i> Oceanic bonito	East Atlantic	14140	L _F	32–78	(kg)	7.480 × 10 ⁻⁶	3.2526	–	Cayré & Laloë (1986)
	<i>Sarda sarda</i> Bonito	Portugal	245	L _F	41–82	650–6200	0.0034	3.285	0.987	Santos <i>et al.</i> (2002)
	<i>Scomber colias</i> Chub mackerel	Portugal	323	L _T	19.5–46.4	50–800	0.0020	3.442	0.966	Mendes <i>et al.</i> (2004)

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length range (cm)	Length range (cm)	Weight range (g)	a	b	r ²	Source
Xiphiidae	<i>Scomber scombrus</i> European mackerel	British Isles	2328	L _T	7–48	2–954	0.0014	3.5440	0.9754	This study
	<i>Thunnus alalunga</i> Long-fin tuna	Bay of Biscay	714	L _F	42–117	(kg)	1.339 x 10 ⁻⁵	3.1066	0.99	Santiago (1993)
	<i>Thunnus albacares</i> Yellow-fin tuna	Atlantic	299	L _F	83.0–176.8	(g)	0.0166	2.969	0.9412	Zhu <i>et al.</i> (2008)
	<i>Thunnus obesus</i> Big-eye tuna	Atlantic	3186	L _F	37–210	(kg)	0.00002396	2.9774	–	Parks <i>et al.</i> (1982)
	<i>Thunnus thynnus</i> Blue-fin tuna	Adriatic Sea	534	L _T	50–152	2500–63000	0.00002	2.96	0.9898	Sinović <i>et al.</i> (2004)
Luvaridae	<i>Xiphias gladius</i> Swordfish	Aegean Sea	974	L _{LJF}	54–215	(kg)	7.5 x 10 ⁻⁶	3.06	0.97	Tsimenides & Tserpes (1989)
	<i>Luvarus imperialis</i> Louvar	–	–	–	–	–	–	–	–	Further studies required
Istiophoridae	<i>Istiophorus albicans</i> Sailfish	NW Atlantic	2187	L _{LJF}	27.1–204.5	0.04–52.7 kg	1.2869 x 10 ⁻⁶	3.2439	0.88	Prager <i>et al.</i> (1995)
	<i>Makaira nigricans</i> Blue marlin	NW Atlantic	5245	L _{LJF}	23–378.5	0.06–540.9 kg	1.1955 x 10 ⁻⁶	3.3663	0.94	Prager <i>et al.</i> (1995)
Centrolophidae	<i>Tetrapturus albidus</i> White marlin	NW Atlantic	4868	L _{LJF}	91.4–205.0	2.7–67.1 kg	5.2068 x 10 ⁻⁶	3.0120	0.72	Prager <i>et al.</i> (1995)
	<i>Centrolophus niger</i> Blackfish	Scotland	33	L _T	39–65.5	409–2462	0.0024	3.3459	–	Coull <i>et al.</i> (1989)
	<i>Hyperoglyphe perciformis</i> Barrelfish	–	–	–	–	–	–	–	–	Further studies required
	<i>Schedophilus medusophagus</i> Cornish blackfish	–	–	–	–	–	–	–	–	Further studies required
	<i>Schedophilus ovalis</i> Imperial blackfish	–	–	–	–	–	–	–	–	Further studies required

continued

Table 5: continued

Family	Scientific name Common name	Location	Sample size	Length		Weight range (g)	a	b	r ²	Source
				Length range (cm)	Length range (cm)					
Scophthalmidae	<i>Lepidorhombus whiffiagonis</i> Megrim	British Isles	4621	L _T	6–58	1–1943	0.0058	3.0736	0.9858	This study
	<i>Lepidorhombus boscii</i> Four-spot megrim	British Isles	13	L _T	23–31	98–287	0.0035	3.3009	0.9366	This study
	<i>Phrynorhombus norvegicus</i> Norwegian topknot	British Isles	378	L _T	3–11	0.8–30	0.0262	2.7505	0.8721	This study
	<i>Phrynorhombus regius</i> Ekström's topknot	British Isles	67	L _T	5–16	2–87	0.0129	3.2052	0.8995	This study
	<i>Scophthalmus maximus</i> Turbot	British Isles	276	L _T	13–69	48–6860	0.0149	3.0791	0.9863	This study
Bothidae	<i>Scophthalmus rhombus</i> Brill	British Isles	377	L _T	16–64	60–3666	0.0140	3.0096	0.9815	This study
	<i>Zeugopterus punctatus</i> Topknot	British Isles	189	L _T	5–18	3–147	0.0206	3.0240	0.9594	This study
	<i>Arnoglossus laterna</i> Scaldfish	British Isles	2303	L _T	3–21	1–75	0.0198	2.6673	0.8411	This study
	<i>Arnoglossus imperialis</i> Imperial scaldfish	British Isles	709	L _T	7–22	3–92	0.0070	3.0541	0.9472	This study
	<i>Arnoglossus thori</i> Thor's scaldfish	Spain	110	L _T	4.9–11.7	0.6–15.2	0.0030	3.489	0.98	Torres <i>et al.</i> (2012)
Pleuronectidae	<i>Glyptocephalus cynoglossus</i> Witch	British Isles	838	L _T	4–50	1–1027	0.0033	3.2048	0.9750	This study
	<i>Hippoglossoides platessoides</i> Long-rough dab	British Isles	2694	L _T	4–30	1–259	0.0105	2.9029	0.9481	This study
	<i>Hippoglossus hippoglossus</i> Halibut	British Isles	7	L _T	54–79	1468–5495	0.0023	3.3796	0.9615	This study
	<i>Limanda limanda</i> Dab	British Isles	6310	L _T	2–35	1–459	0.0171	2.8468	0.9796	This study

continued

Table 5: continued

[illegible]

Acknowledgments

Grateful thanks to S. Kupschus, B. Harley, I. Holmes, T. Maxwell, S. McCully, S. Songer, A. Tidd, J. Van Der Kooij and the many field going staff for collecting these data during field surveys. Thanks to E.C.E. Potter, I.C. Russell and A.M. Walker from Salmon and Freshwater team for information on diadromous fish species. Additional thanks to D. Maxwell, M. Parker-Humphreys, F. Scott and S. Kupschus for their help with R and also to G. Burt, A. Tidd and S. Warnes who kindly provided comments on the report.

References

- ABDALLAH, M. 2002. Length-weight relationships of fishes caught by trawl off Alexandria, Egypt. *Naga*, 25: 19–20.
- AKYOL, O., KINACIGIL, H.T. AND ŞEVİK, R. 2007. Longline fishery and length-weight relationships for selected fish species in Gökova Bay (Aegean Sea, Turkey). *International Journal of Natural and Engineering Sciences*, 1: 1–4.
- AZEVEDO, J.M.N., AND HOMEI, N. 2002. Age and growth, reproduction and diet of the red blenny *Parablennius ruber* (Blenniidae). *Cybio*, 26: 129–133.
- BAŞUSTA, A., BAŞUSTA, N., SULIKOWSKI, J.A., DRIGGERS, W.B., DEMIRHAN, S.A. AND ÇİÇEK, E. 2012. Length-weight relationships for nine species of batoids from the Iskenderun Bay, Turkey. *Journal of Applied Ichthyology*, 28: 850–851.
- BAYHAN, B., SEVERL, T.M. AND TAŞKAVAK, E. 2009. Length-weight relationships of seven flatfishes (Pisces: Pleuronectiformes) from Aegean Sea. *Turkish Journal of Fisheries and Aquatic Sciences*, 8: 377–379.
- BEDFORD, B.C., WOOLNER, L.E. AND JONES, B.W. 1986. Length-weight relationships for commercial fish species and conversion factors for various presentations. Fisheries Research Data Report, MAFF Directorate of Fisheries Research, 10: 41 pp.
- BEN AMOR, M.M., BEN SALEM, M., REYNAUD, C. AND CAPAPÉ, C. 2011. Length-weight relationships in syngnathid species from Tunisian waters (central Mediterranean). *Marine Biodiversity Records*, 4, e44: 4 pp.
- BORGES, T.C., OLIM, S. AND ERZINI, K. 2003. Weight-length relationships for fish species discarded in commercial fisheries of the Algarve (southern Portugal). *Journal of Applied Ichthyology*, 19: 394–396.
- CAN, M.F., BAŞUSTA, N. AND ÇEKİÇ, M. 2002. Weight-length relationships for selected fish species of the small-scale fisheries off the south coast of Iskenderun Bay. *Turkish Journal of Veterinary and Animal Sciences*, 26: 1181–1183.
- CARSS, D.N. 1993. Shags *Phalacrocorax aristotelis* at cage fish farms in Argyll, Western Scotland, *Bird Study*, 40: 203–211.
- CAYRÉ, P. AND LALOË, F. 1986. Relation poids-longueur de listao (*Katsuwonus pelamis*) de l'Océan Atlantique. *Proc ICCAT International Skipjack Year Program*, 1: 335–340.
- CHERIF, M., ZARRAD, R., GHARBI, H., MISSAOUI, H. AND JARBOUI, O. 2008. Length-weight relationships for 11 fish species from the Gulf of Tunis (SW Mediterranean Sea, Tunisia). *Pan-American Journal of Aquatic Sciences*, 3: 1–5.
- CİÇEK, E., AVSAR, D., YELDAN, H. AND ÖZÜTOK, M. 2006. Length-weight relationships for 31 teleost fishes caught by bottom trawl net in the Babadillimani Bight (northeastern Mediterranean). *Journal of Applied Ichthyology*, 22: 290–292.
- COULL, K.A., JERMYN, A.S., NEWTON, A.W., HENDERSON, G.I. AND HALL, W.B. 1989. Length/weight relationships for 88 species of fish encountered in the North East Atlantic. *Scottish Fisheries Research Report*, 43: 81 pp.
- CRABTREE, R.E., CYR, E.C. AND DEAN J.M. 1995. Age and growth of tarpon, *Megalops atlanticus*, from south Florida waters. *Fishery Bulletin*, 93: 619–628.
- DEMIRHAN, S.A. AND CAN, M.F. 2007. Length-weight relationships for seven fish species from the southeastern Black Sea. *Journal of Applied Ichthyology*, 23: 282–283.
- DOREL, D. 1986. Poissons de l'Atlantique nord-est relations taille-poids. Ifremer, Nantes. 165 pp.
- DULČIĆ, J. AND GLAMUZINA, B. 2006. Length-weight relationships for selected fish species from three eastern Adriatic estuarine ecosystems. *Journal of Applied Ichthyology*, 22: 254–256.
- DULČIĆ, J. AND KRALJEVIĆ, M. 1996. Weight-length relationships for 40 fish species in the eastern Adriatic (Croatian waters). *Fisheries Research*, 28: 243–251.
- DULČIĆ, J. AND KRALJEVIĆ, M. 1997. Corrigendum to "Weight-length relationships for 40 fish species in the eastern Adriatic (Croatian waters)" [*Fisheries Research* 28 (1996) 243–251]. *Fisheries Research*, 30: 169–171.
- ELLIS, J.R., MILLIGAN, S.P., READDY, L., TAYLOR, N. AND BROWN, M.J. 2012. Spawning and nursery grounds of selected fish species in UK waters. *Science Series Technical Report*, Cefas, Lowestoft, 147: 56 pp.
- ENEVER, R., REVILL, A. AND GRANT, A. 2007. Discarding in the English Channel, Western approaches, Celtic and Irish seas (ICES subarea VII). *Fisheries Research*, 86: 143–152.

- ERGUDEN, D., TURAN, C. AND GURLEK, M. 2009. Weight-length relationships for 20 Lessepsian fish species caught by bottom trawl on the coast of Iskenderun Bay (NE Mediterranean Sea, Turkey). *Journal of Applied Ichthyology*, 25: 133–135.
- ESCHMEYER, W.N. (ed) 2013. *Catalog of Fishes*. California Academy of Sciences (<http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>). Electronic version accessed January 2013.
- FERREIRA, S., SOUSA, R., DELGADO, J., CARVALHO, D. AND CHADA, T. 2008. Weight-length relationships for demersal fish species caught off the Madeira archipelago (eastern-Central Atlantic). *Journal of Applied Ichthyology*, 24: 93–95.
- FILIZ, H. AND BILGE, G. 2004. Length-weight relationships of 24 fish species from the North Aegean Sea, Turkey. *Journal of Applied Ichthyology*, 20: 431–432.
- FILIZ, H. AND MATER, S. 2002. A preliminary study on length-weight relationships for seven elasmobranch species from north Aegean Sea, Turkey. *Journal of Fisheries and Aquatic Sciences*, 19: 401–409.
- GHAILEN, H., ABDALLAH, H., HASSAN, A., MOURAD, C., ABDERRAHMEN, B. AND OTHMAN, J. 2010. Length-weight relationships for 13 fish species from the Gulf of Gabes (Southern Tunisia, Central Mediterranean). *African Journal of Biotechnology*, 9: 6177–6181.
- GIACALONE, V.M., D'ANNA, G., BADALAMENTI, F. AND PIPITONE, C. 2010. Weight-length relationships and condition factor trends for thirty-eight fish species in trawled and untrawled areas off the coast of northern Sicily (central Mediterranean Sea). *Journal of Applied Ichthyology*, 26: 954–957.
- GONÇALVES, J.M.S., BENTES, L., LINO, P.G., RIBEIRO, J., CANÁRIO, A.V.M. AND ERZINI, K. 1997. Weight-length relationships for selected fish species of the small-scale demersal fisheries of the south and south-west coast of Portugal. *Fisheries Research*, 30: 253–256.
- GRIFFITHS, A.M., SIMS, D.W., COTTERELL, S.P., EL NAGAR, A., ELLIS, J.R., LYNHAMMAR, A., MCHUGH, M., NEAT, F.C., PADE, N.G., QUEIROZ, N., SERRA-PEREIRA, B., RAPP, T., WEARMOUTH, V.J. AND GENNER, M.J. 2010. Molecular markers reveal spatially segregated cryptic species in a critically endangered fish, the common skate (*Dipturus batis*). *Proceedings of the Royal Society B*, 277: 1497–1503.
- GURKAN, S. AND TAŞKAVAK, E. 2007. Length-weight relationships for syngnathid fishes of the Aegean Sea, Turkey. *Belgian Journal of Zoology*, 137: 219–222.
- GÜVEN, O., KEBAPÇIOĞLU, T. AND DEVAL, M.C. 2012. Length-weight relationships of sharks in Antalya Bay, eastern Mediterranean. *Journal of Applied Ichthyology*, 28: 278–279.
- HARLEY, B. AND ELLIS, J. 2007. The modified GOV and ground gear 'D'. ICES CM/Q:02, 32pp.
- HENNACHE, C., AND JUNG, A. 2010. Etude de la pêche palangrière de requin taupe de l'île d'Yeu. Rapport Final. Association pour l'étude et la conservation des sélaciens (APECS), 64pp.
- ICES, 1997. Report of the Study Group on Elasmobranch Fishes, 26–30 May 1997, Copenhagen, Denmark. ICES Document CM 1997/G: 02, 123pp.
- ICES, 2009. Manual for the Offshore Beam Trawl Surveys, Revision 1.2, June 2009, Working Group on Beam Trawl Surveys, 30pp.
- ICES, 2012. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols. SISP 1-IBTS VIII, 68pp.
- IGLÉSIAS, S.P., TOULHOAT, L. AND SELLOS, D.Y. 2010. Taxonomic confusion and market mislabelling of threatened skates: important consequences for their conservation status. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 20: 319–333.
- ILKYAZ, A.T., METIN, G., SOYKAN, O. AND KINACIGIL, H.T. 2008. Length-weight relationship of 62 fish species from the Central Aegean Sea, Turkey. *Journal of Applied Ichthyology*, 24: 699–702.
- ISMEN, A., CIGDEM YIGIN, C., ALTINAGAC, U. AND AYAZ, A. 2009. Length-weight relationships for ten shark species from Saros Bay (North Aegean Sea). *Journal of Applied Ichthyology*, 25: 109–112.
- ISMEN, A., OZEN, O., ALTINAGAC, U., OZEKINCI, U. AND AYAZ, A. 2007. Weight-length relationships of 63 fish species in Saros Bay, Turkey. *Journal of Applied Ichthyology*, 23: 707–708.
- KALAYCI, F., SAMSUN, N., BILGIN, S. AND SAMSUN, O. 2007. Length-weight relationships of 10 fish species caught by bottom trawl and midwater trawl from the middle Black Sea, Turkey. *Turkish Journal of Fisheries and Aquatic Sciences*, 7: 33–36.
- KARAKULAK, F.S., ERK, H. AND BILGIN, B. 2006. Length-weight relationships for 47 coastal fish species from the northern Aegean Sea, Turkey. *Journal of Applied Ichthyology*, 22: 274–278.
- KING, P.A. 1989. Littoral and Benthic Investigations on the West Coast of Ireland: XXII, The Biology of a Population of Shore Clingfish *Lepadogaster lepadogaster* (Bonnaterre, 1788) at Inishbofin, Co. Galway. *Proceedings of the Royal Irish Academy. Section B: Biological, Geological, and Chemical Science*, 89 B: 47–58.

- KOHLER, N.E., CASEY, J.G. AND TURNER, P.A. 1995. Length-weight relationships for 13 species of sharks from the western North Atlantic. 1995. Fishery Bulletin, 93: 412–418.
- KOHLER, N.E., CASEY, J.G. AND TURNER, P.A. 1996. Length-length and length-weight relationships for 13 shark species from the western North Atlantic. NOAA Technical Memorandum NMFS-NE-110, 22 pp.
- KOUTRAKIS, E.T. AND TSILIRAS, A.C. 2003. Length-weight relationships of fishes from three northern Aegean estuarine systems (Greece). Journal of Applied Ichthyology, 19: 258–260.
- KRISTOFFERSSON, R. AND OIKARI, A. 1975. Notes on the biology of the eelpout, *Zoarces viviparus* (L.), in the brackish water of Tvärminne, Gulf of Finland. Annales Zoologici Fennici, 12: 143–147.
- KUKUEV, E.I. AND PAVLOV, V.P. 2008. The first case of mass catch of a rare frill shark *Chlamydoselachus anguineus* over a seamount of the Mid-Atlantic Ridge Journal of Ichthyology, 48 (8): 676–678.
- LA MESA, M. 2001. Age and growth of *Crystallogobius linearis* (von Düben, 1845) (Teleostei: Gobiidae) from the Adriatic Sea. Scientia Marina, 65: 375–381.
- LAMPRAKIS, M.K., KALLIANIOTIS, A.A. AND MOUTOPOULOS, D.K. AND STERGIOU, K.I. 2003. Weight-length relationships of fishes discarded by trawlers in the North Aegean Sea. Acta Ichthyologica et Piscatoria, 33: 145–152.
- LIOSIA, V., BATZIAKAS, S., PANAGIOTOU, N., DAOUTI, I., KOUTRAKIS, E. AND LEONARDOS, I.D. 2012. Length-weight relations of 22 fish species from the littoral zone of the eastern Ionian Sea, Greece. Acta Ichthyologica et Piscatoria, 42: 69–72.
- LOBO, C. AND ERZINI, K. 2001. Age and growth of Ray's bream (*Brama brama*) from the south of Portugal. Fisheries Research, 51: 343–347.
- LOURIE, S. 2003. Measuring seahorses. Project Seahorse Technical Report No.4, Version 1.0. Project Seahorse, Fisheries Centre, University of British Columbia. 15pp.
- MACNEIL, M.A., MCMEANS, B.C., HUSSEY, N.E., VECSEI, P., SVAVARSSON, J., KOVACS, K.M., LYDERSEN, C., TREBLE, M.A., SKOMAL, G.B., RAMSEY, M. AND FISK, A.T. 2012. Biology of the Greenland shark *Somniosus microcephalus*. Journal of Fish Biology, 80: 991–1018.
- MAIA, A., QUEIROZ, N., CABRAL, H.N., SANTOS, A.M. AND CORREIA, J.P. 2007. Reproductive biology and population dynamics of the shortfin mako, *Isurus oxyrinchus* Rafinesque, 1810, off the southwest Portuguese coast, eastern North Atlantic. Journal of Applied Ichthyology, 24: 246–251.
- MARTINS, M.R., MARTINS, M.M. AND CARDADOR, F. 1989. Portuguese fishery of black scabbardfish (*Aphanopus carbo* Lowe, 1839) off Sesimbra waters. ICES Document CM 1989/G:38, 14pp. + tables and figures.
- MATA, A.J., MORALES, J. AND MÁRQUEZ, L. 2008. Weight-length relationships for 26 demersal fish species of the Spanish South-Atlantic coastal waters. Journal of Applied Ichthyology, 24: 330–333.
- McCULLY, S.R., SCOTT, F., AND ELLIS, J.R. 2012. Lengths at maturity and conversion factors for skates (Rajidae) around the British Isles, with an analysis of data in the literature. ICES Journal of Marine Science, 69: 1812–1822.
- MENDES, B., FONSECA, P. AND CAMPOS, A. 2004. Weight-length relationships for 46 fish species of the Portuguese west coast. Journal of Applied Ichthyology, 20: 355–361.
- MERELLA, P., QUETGLAS, A., ALEMANY, F. AND CARBONELL, A. 1997. Length-weight relationship of fishes and cephalopods from the Balearic Islands (western Mediterranean). Naga, 20: 66–68.
- MORATO, T., AFONSO, P., LOURINHO, P., BARREIROS, J.P., SANTOS, R.S. AND NASH, R.D.M. 2001. Length-weight relationships for 21 coastal fish species of the Azores, north-eastern Atlantic. Fisheries Research, 50: 297–302.
- MOREY, G., MORANTA, J., MASSUTÍ, E., GRAU, A., LINDE, M., RIERA, F. AND MORALES-NIN, B. 2003. Weight-length relationships of littoral to lower slope fishes from the western Mediterranean. Fisheries Research, 62: 89–96.
- MOUS, P.J. 2000. Interactions between fisheries and birds in IJsselmeer, The Netherlands. PhD Thesis, Wageningen Universiteit.
- MOUTOPOULOS, D.K. AND STERGIOU, K.I. 2002. Length-weight and length-length relationships of fish species from the Aegean Sea (Greece). Journal of Applied Ichthyology, 18: 200–203.
- OLIM, S. AND BORGES, T.C. 2006. Weight-length relationships for eight species of the family Triglidae discarded on the south coast of Portugal. Journal of Applied Ichthyology, 22: 257–259.
- OXENFORD, H.A., 1999. Biology of the dolphinfish (*Coryphaena hippurus*) in the western central Atlantic: A review. Scientia Marina, 63: 277–301.
- ÖZAYDIN, O. AND TASKAVAK, E. 2006. Length-weight relationships for 47 fish species from Izmir Bay (eastern Aegean Sea, Turkey). Acta Adriatica, 47: 211–216.
- ÖZAYDIN, O., UÇKUN, D., AKALIN, S., LEBLEBICI, S. AND TOSUNOĞLU, Z. 2007. Length-weight relationships of fishes captured from Izmir Bay, Central Aegean Sea. Journal of Applied Ichthyology, 23: 695–696.

- OZEN, O., AYYILDIZ, H., OZTEKIN, A. AND ALTIN, A. 2009. Length-weight relationships of 17 less-studied fish species from Çanakkale, Marmara region of Turkey. *Journal of Applied Ichthyology*, 25: 238–239.
- PALLAORO, A., JARDAS, I. AND ŠANTIĆ, M. 2005. Weight-length relationships for 11 chondrichthyan species in the eastern Adriatic Sea. *Cybium*, 29: 93–96.
- PARKS, W., BARD, F.X., CAYRÉ, P., KUME, S. AND GUERRA, A.S. 1982. Length-weight relations for bigeye tuna captured in the eastern Atlantic Ocean. ICCAT Collective Volume of Scientific Papers, 17: 214–225.
- PARKER-HUMPHREYS, M. 2004a. Distribution and relative abundance of demersal fishes from beam trawl surveys in the Irish Sea (ICES Division VIIa) 1993–2001. Science Series Technical Report, Cefas, Lowestoft, 120: 68pp.
- PARKER-HUMPHREYS, M. 2004b. Distribution and relative abundance of demersal fishes from beam trawl surveys in the Bristol Channel (ICES Division VIIf) 1993–2001. Science Series Technical Report, Cefas, Lowestoft, 123: 67pp.
- PARKER-HUMPHREYS, M. 2005. Distribution and relative abundance of demersal fishes from beam trawl surveys in eastern English Channel (ICES Division VIId) and the southern North Sea (ICES Division IVc) 1993–2001. Science Series Technical Report, Cefas, Lowestoft, 124: 92pp.
- PAZ, X. AND ROMÁN, E. 1997. Length/weight relationships for some species of fish encountered in the North West Atlantic (NAFO Regulatory Area: Divisions 31, 3M and 3NO). NAFO SCR Doc. 97/15: 8pp.
- PEREDA, P. AND VILLAMOR, B. 1991. Relaciones biométricas en peces de la plataforma Cantábrica. Informes Técnicos. Instituto Español de Oceanografía, 92: 39pp.
- PÉREZ, P.P. AND CONTRERAS, N.P. 1995. Relaciones talla-peso de peces capturados en las campañas de arrastre demersal, Demersales 0993 y Demersales 0994. Informes Técnicos. Instituto Español de Oceanografía, 159: 16pp.
- PETRAKIS, G. AND STERGIOU, K.I. 1995. Weight-length relationships for 33 fish species in Greek waters. *Fisheries Research*, 21: 465–469.
- PRAGER, M.H., PRINCE, E.D. AND LEE, D.W. 1995. Empirical length and weight conversion equations for blue marlin, white marlin, and sailfish from the North Atlantic Ocean. *Bulletin of Marine Science*, 56: 201–210.
- R DEVELOPMENT CORE TEAM 2012. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3–900051–07–0, <http://www.R-project.org>.
- REÑONES, O., MORALES-NIN, B. AND DEUDERO, S. 1999. Population size structure, age and growth of *Naucrates ductor* in the small scale FADs fishery of Mallorca Island (western Mediterranean). *Scientia Marina*, 63: 355–366.
- RIBEIRO-PRADO, C.C. AND AMORIM, A.F. 2008. Fishery biology on pelagic stingray *Pteroplatytrygon violacea* caught off southern Brazil by longliners settled in Sao Paulo State (2006–2007). Collective Volume of Scientific Papers ICCAT, 62 (6): 1883–1891.
- ROBINSON, L.A., GREENSTREET, S.P.R., REISS, H., CALLAWAY, R., CRAEYMEERSCH, J., DE BOOIS, I., DEGRAER, S., EHRRICH, S., FRASER, H.M., GOFFIN, A., KRÖNCKE, I., LINDAL JORGENSEN, L., ROBERTSON, M.R. AND LANCASTER, J. 2010. Length-weight relationships of 216 North Sea benthic invertebrates and fish. *Journal of the Marine Biological Association of the United Kingdom*, 90: 95–104.
- ROSA, A., MENEZES, G., MELO, O. AND PINHO, M.R. 2006. Weight-length relationships of 33 demersal fish species from Azores archipelago. *Fisheries Research*, 80: 329–332.
- SANGUN, L., AKAMCA, E. AND AKAR, M. 2007. Weight-length relationships for 39 fish species from the north-eastern Mediterranean coast of Turkey. *Turkish Journal of Fisheries and Aquatic Sciences*, 7: 37–40.
- SANTIAGO, J. 1993. A new length-weight relationship for the north Atlantic albacore. International Commission for the Conservation of Atlantic Tunas, Collective Volume of Scientific Papers, 40: 316–319.
- SANTOS, M.N., GASPAR, M.B., VASCONCELOS, P. AND MONTEIRO, C.C. 2002. Weight-length relationships for 50 selected fish species of the Algarve coast (southern Portugal). *Fisheries Research*, 59: 289–295.
- SAYER, M.D.J., GIBSON, R.N. AND ATKINSON, R.J.A. 1996. Growth, diet and condition of corkwing wrasse and rock cook on the west coast of Scotland. *Journal of Fish Biology*, 49: 76–94.
- SINOVIĆ, G., FRANIČEVIĆ, M., ZORICA, B. AND ČIKEŠ-KEČ, V. 2004. Length-weight and length-length relationships for 10 pelagic fish species from the Adriatic Sea (Croatia). *Journal of Applied Ichthyology*, 20: 156–158.
- STERGIOU, K.I. AND MOUTOPOULOS, D.K. 2001. A review of length-weight relationships of fishes from Greek marine waters. *Naga*, 24: 23–39.
- TORRES, F. 1991. Tabular data on marine fishes from Southern Africa, Part I. Length-weight relationships. *Fishbyte*, 9: 50–53.
- TORRES, M.A., RAMOS, F. AND SOBRINO, I. 2012. Length-weight relationships of 76 fish species from the Gulf of Cadiz (SW Spain). *Fisheries Research*, 127–128: 171–175.

- TSIMENIDES, N. AND TSERPES, G. 1989. Age determination and growth of swordfish, *Xiphias gladius* L., 1758, in the Aegean Sea. *Fisheries Research*, 8: 159–168.
- VALLE, C., BAYLE, J.T. AND RAMOS, A.A. 2003. Weight-length relationships for selected fish species of the western Mediterranean Sea. *Journal of Applied Ichthyology*, 19: 261–262.
- VALLISNERI, M., MONTANINI, S. AND STAGIONI, M. 2010. Length-weight relationships for the family Triglidae in the Adriatic Sea, northeastern Mediterranean. *Journal of Applied Ichthyology*, 26: 460–462.
- VASKE JUNIOR, T., LESSA, R.P., TRAVASSOS, P.E., SALES, L.T. AND HAZIN, F.H.V. 1998. The longnose lancetfish, *Alepisaurus ferox*, Lowe (Pisces: Aulopiformes) from northeastern Brazil. *Ciência e Cultura*, 50: 464–467.
- VÁZQUEZ, J. 1989. Biología de *Notacanthus nasus* Bloch 1795 (Pisces: Notacanthidae). *Boletín del Instituto Español de Oceanografía* 5(2): 101–106.
- VEIGA, P., MACHADO, D., ALMEIDA, C., BENTES, L., MONTEIRO, P., OLIVEIRO, F., RUANO, M., ERZINI, K. AND GONÇALVES, J.M.S. 2009. Weight-length relationships for 54 species of the Arade estuary, southern Portugal. *Journal of Applied Ichthyology*, 25: 493–496.
- VERDIELL-CUBEDO, D., OLIVA-PATERNA, F.J. AND TORRALVA, M. 2006. Length-weight relationships for 22 fish species of the Mar Menor coastal lagoon (western Mediterranean Sea). *Journal of Applied Ichthyology*, 22: 293–294.
- VERREYCKEN, H., VAN THUYNE, G. AND BELPAIRE, C. 2011. Length-weight relationships of 40 freshwater fish species from two decades of monitoring in Flanders (Belgium). *Journal of Applied Ichthyology*, 27: 1416–1421.
- VIEIRA, R.P., BENTES, L., MONTEIRO, P., RIBEIRO, J., ERZINI, K. AND GONÇALVES, J.M.S. 2013. Weight-length relationships for five fish species from a temperate coastal lagoon of southern Europe. *Journal of Applied Ichthyology*, 29: 292–293.
- WHEELER, A. 1992. A list of the common and scientific names of fishes of the British Isles. *Journal of Fish Biology* 41 (Suppl. A), 1–37.
- WHEELER, A.C., MERRETT, N.R. AND QUIGLEY, D.T.G. 2004. Additional records and notes for Wheeler's (1992) list of the common and scientific names of fishes of the British Isles. *Journal of Fish Biology* 65 (Suppl. B), 1–40.
- YELDAN, H. AND AVSAR, D. 2007. Length-weight relationship for five elasmobranch species from the Cilician Basin shelf waters (Northeastern Mediterranean). *Journal of Applied Ichthyology*, 23: 713–714.
- YİĞİN, C.C. AND İSMEN, A. 2009. Length-weight relationships for seven rays from Saros Bay (North Aegean Sea). *Journal of Applied Ichthyology*, 25: 106–108.
- ZHU, G., XU, L., ZHOU, Y. AND DAI, X. 2008. Length-frequency compositions and weight-length relations for bigeye tuna, yellowfin tuna, and albacore (Perciformes: Scombrinae) in the Atlantic, Indian, and eastern Pacific Oceans. *Acta Ichthyologica et Piscatoria*, 38: 157–161.

Annex 1: Cefas Research Vessel Electronic Data Capture system (RV EDC) – A description

Cefas Research Vessel Electronic Data Capture system (RV EDC) is a hardware and software system that captures and stores data regarding the catches from survey fishing gear. The system was originally developed in the early 1990s and has undergone an almost continual process of extension to enhance its functionality. The base hardware has also evolved during this time from re-cased laptops and bar-code readers to custom data capture units and PIT-tag readers. The software is written in Microsoft® Visual Basic (versions 3–6) and uses Microsoft® Access database files.

The handling of survey catches can be broken down into three processes:

Catch composition

The bulk catch is sorted into its constituent species or species groups (a catch element), the whole catch may be sorted or a variety of sub-sampling methods employed to reduce the workload. A species catch may be broken down further into size classes to ensure subsequent size samples are representative of the whole catch. The presence of each catch element is recorded, the element data may also include total weight, catch numbers and whether length or more detailed biological sampling will take place. RV EDC facilitates the recording part of this process by capturing the element data either from manual input or directly from marine scales. These data are validated and stored in a database for merging at a later stage with size sample data and biological data.

Size sampling

RV EDC captures size distribution data along with sampling information (e.g. sub-sample weight). The system can handle species measured in whole cm, 0.5 cm or mm (for shellfish species e.g. edible crab *Cancer pagurus*, European lobster *Homarus gammarus* and *Nephrops norvegicus*). During the measuring process the system manages and prompts the user to collect biological samples to meet pre-set targets (see below). The system presents the user with brief summary statistics to allow the operator to assess the quality of the sample and, if necessary and possible, sample additional fish to ensure appropriate levels of sampling have taken place. During the size sampling process the system can collect individual fish weights from linked marine scales. These individual weights are not currently taken on a stratified basis; if length weight collection is selected then all fish are weighed.

Biological sampling

During the size sampling process the user is prompted to take biological samples (otoliths) from individual fish that are required to meet a pre-determined target. Biological sampling targets can be defined in a number of ways: targets can be set by cruise, station or user-defined strata (e.g. depth band), and individual fish either by actual size or size class. Once a fish is identified as being required to meet a particular target the user is prompted to collect the otolith and provide additional data such as sex, maturity and weight. Otoliths are stored in plastic trays containing 25, 48 or 96 cells, the system manages these trays and ensures cells are only used once.

When all sampling for a station is complete, the data are merged from each workstation with the catch element data, data regarding biological samples taken is subsequently uploaded to each workstation to ensure the sample targeting at the next station is up-to-date. Finally the merged catch and sample data are uploaded to the main server where it is combined with position, gear and environmental data for the station.

Annex 2: Length-weight relationships for species collected from around the British Isles (2009–2012)

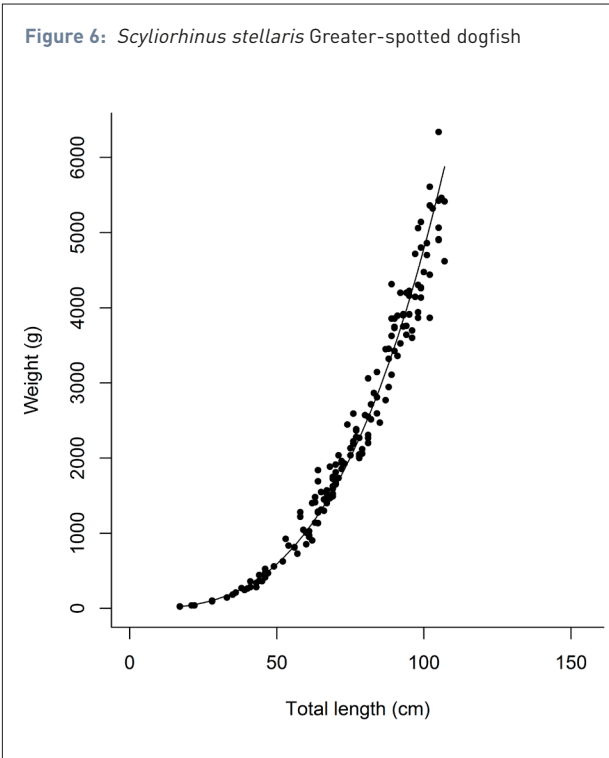
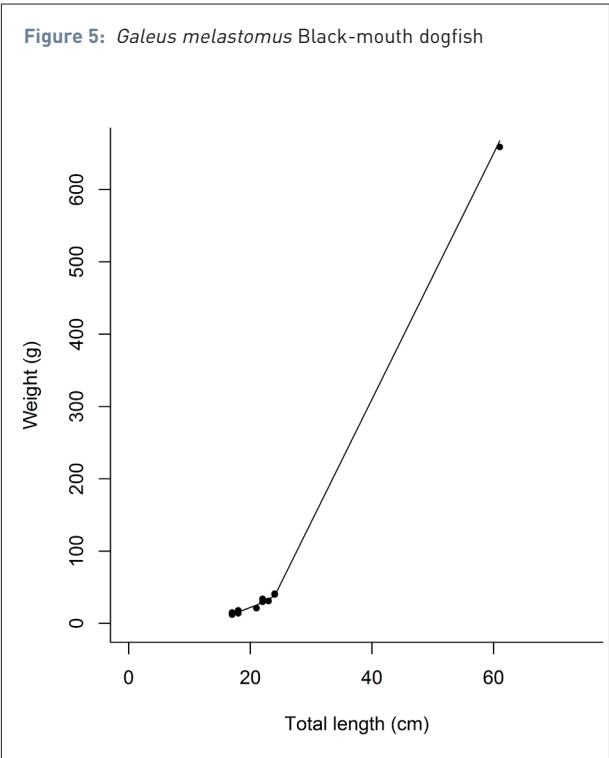
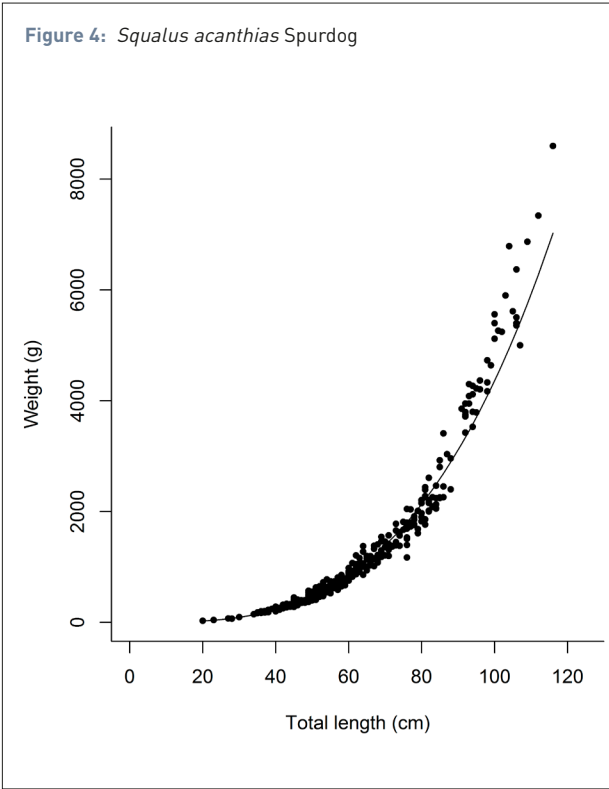
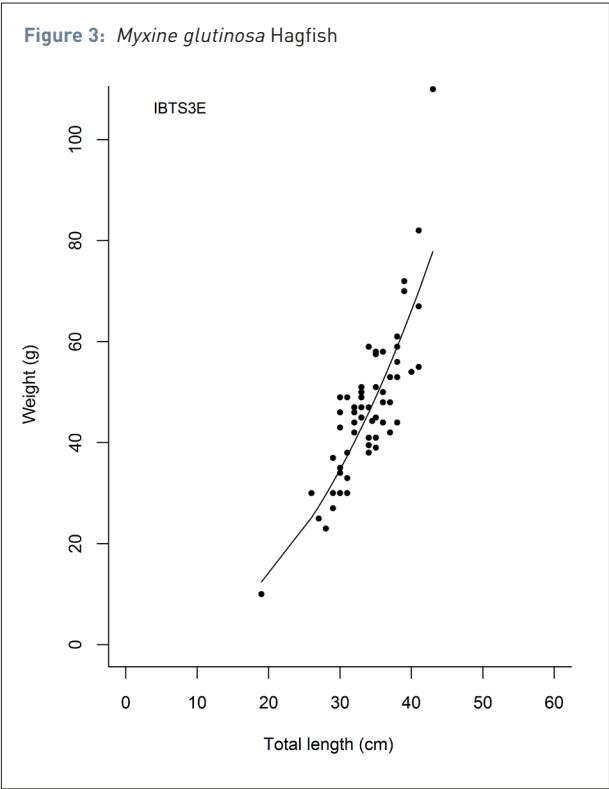


Figure 7: *Scyliorhinus canicula* Lesser-spotted dogfish

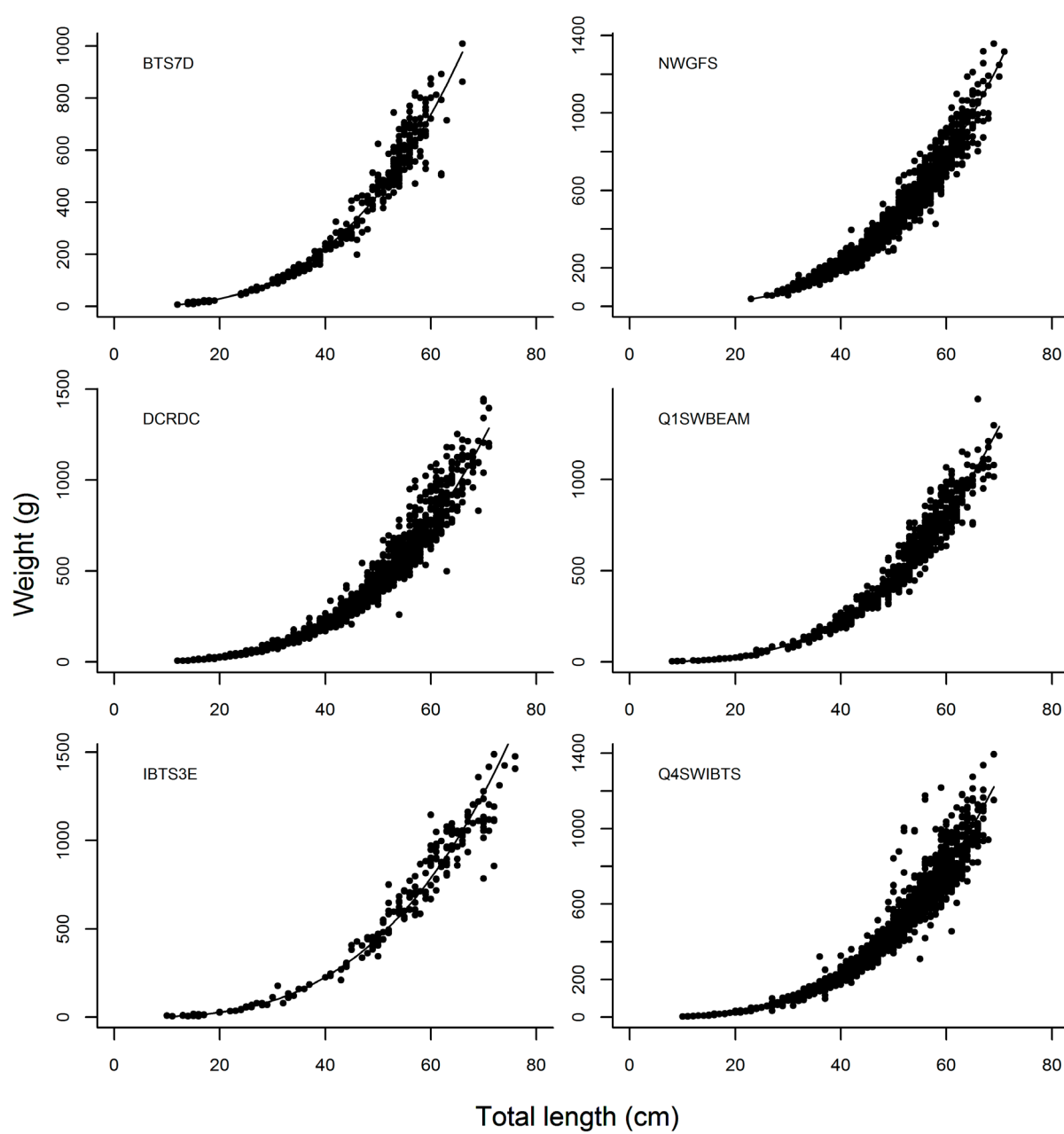


Figure 8: *Mustelus* spp. Smooth-hound

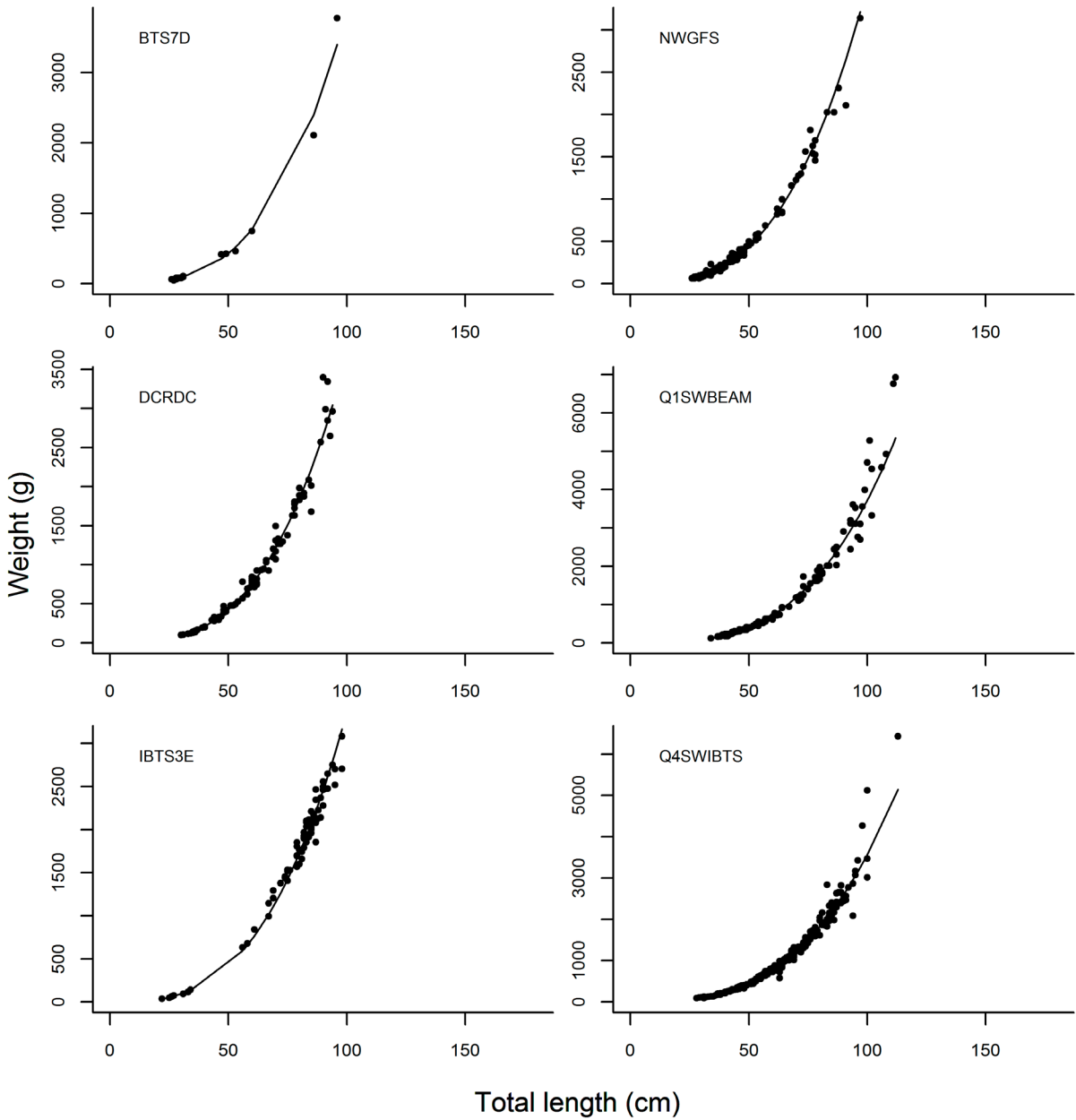


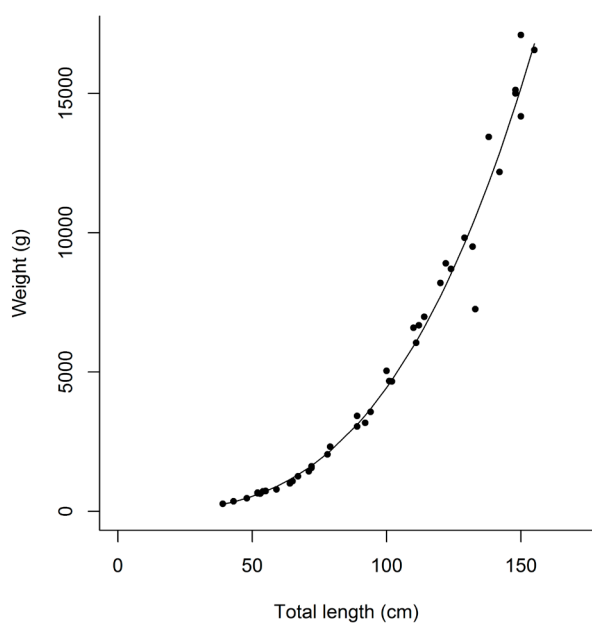
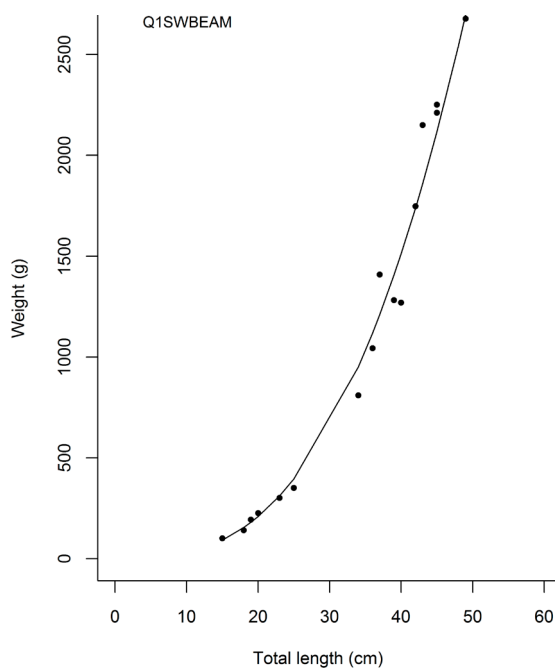
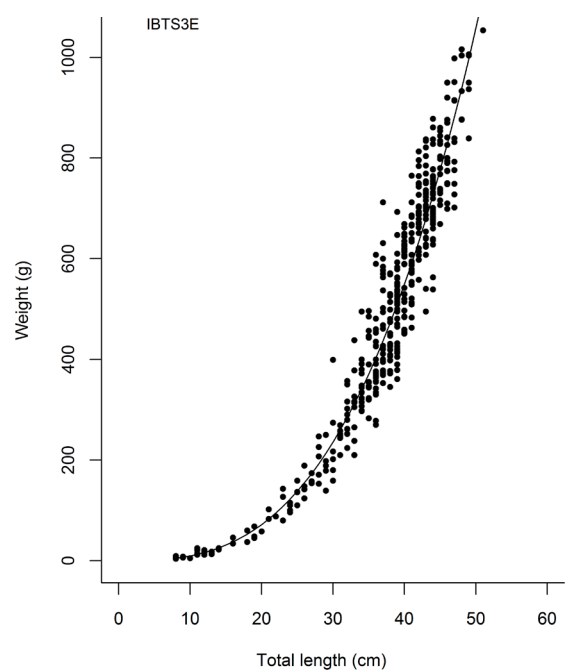
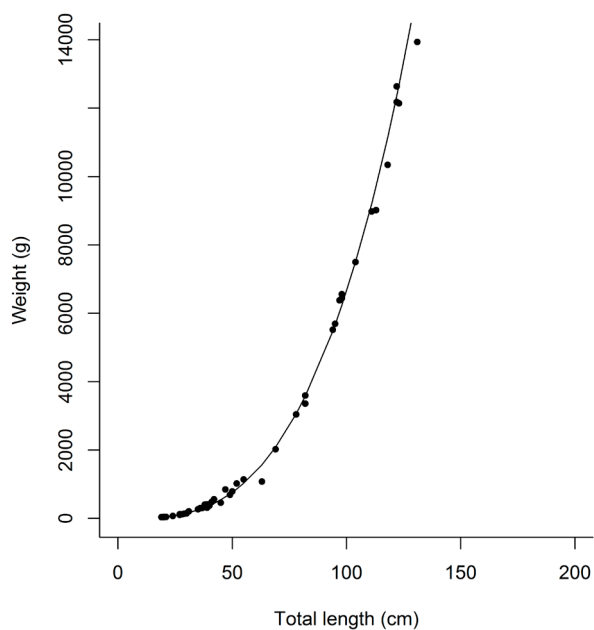
Figure 9: *Galeorhinus galeus* Tope**Figure 10:** *Torpedo marmorata* Marbled electric ray**Figure 11:** *Amblyraja radiata* Starry ray**Figure 12:** *Dipturus batis*-complex Common skate

Figure 13: *Leucoraja naevus* Cuckoo ray

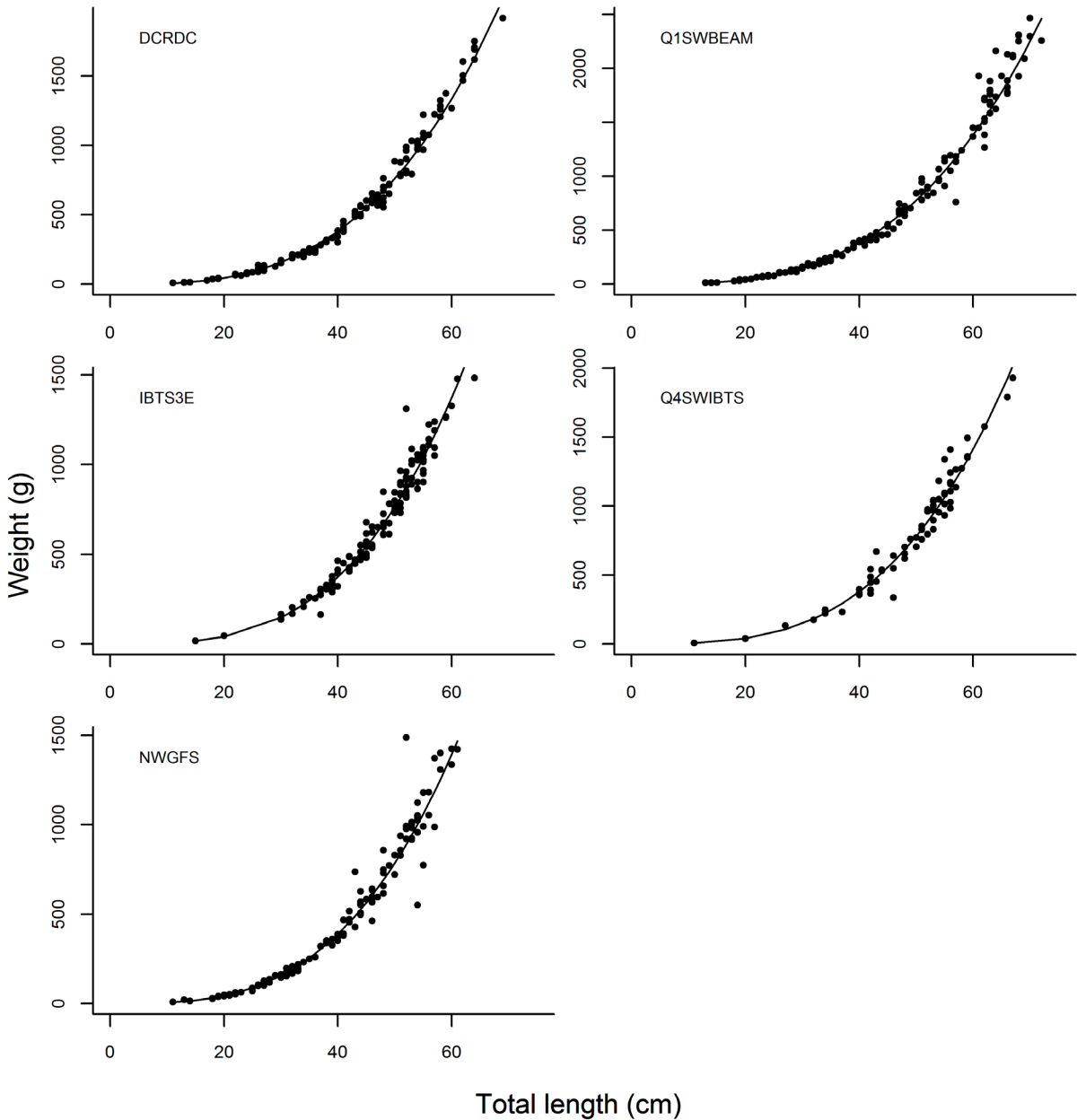


Figure 14: *Raja brachyura* Blonde ray

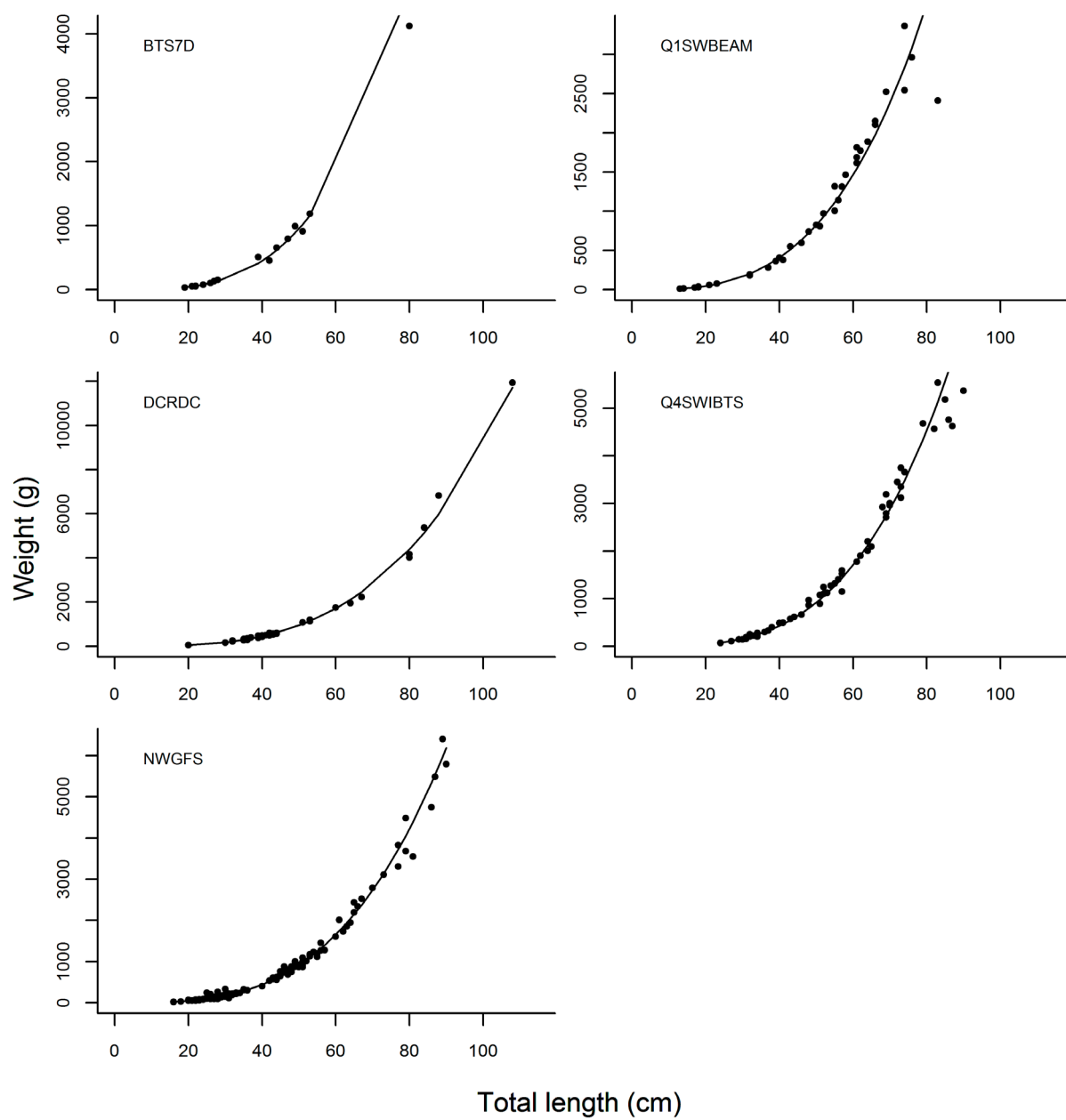


Figure 15: *Raja clavata* Thornback ray

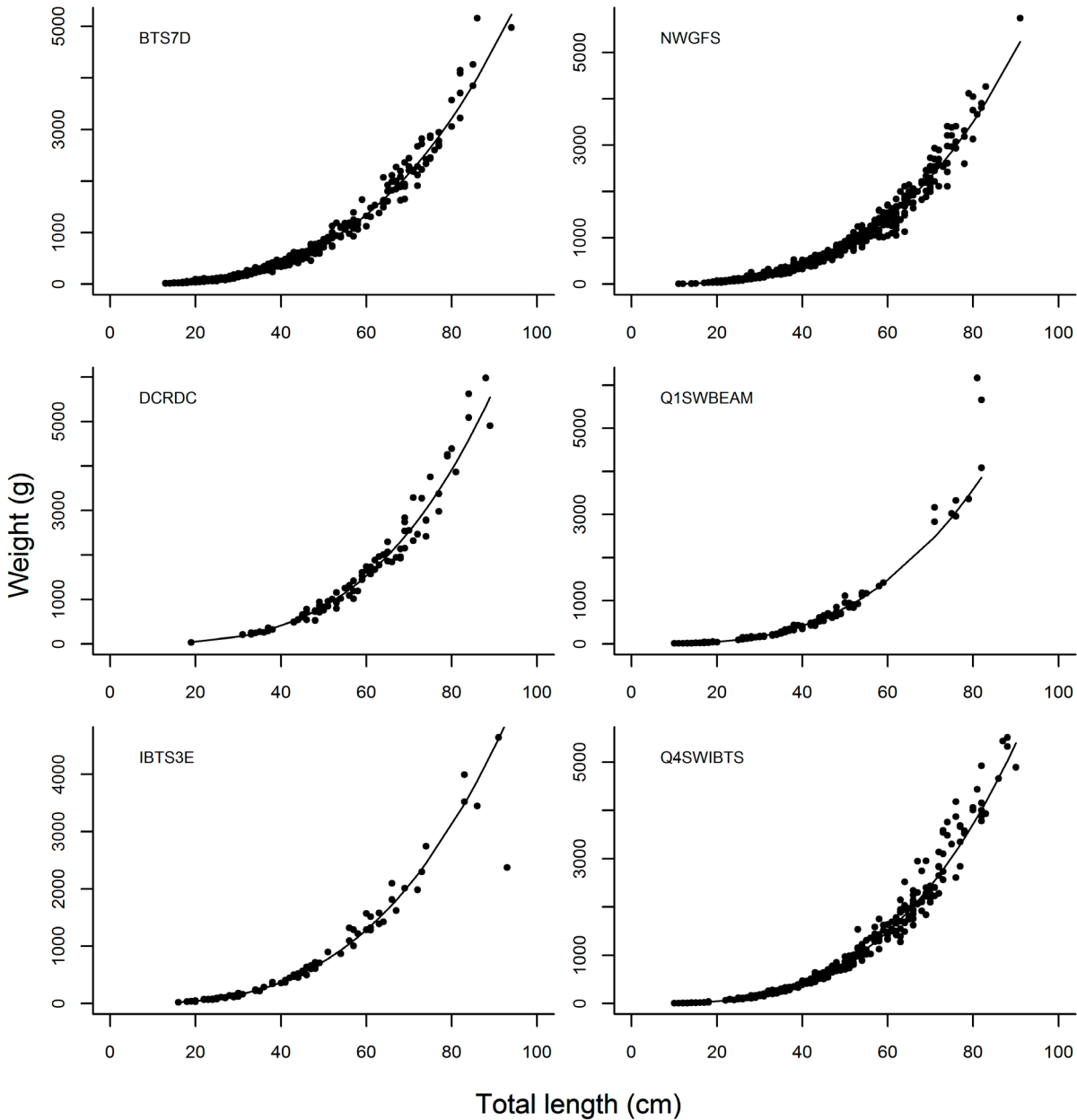


Figure 16: *Raja montagui* Spotted ray

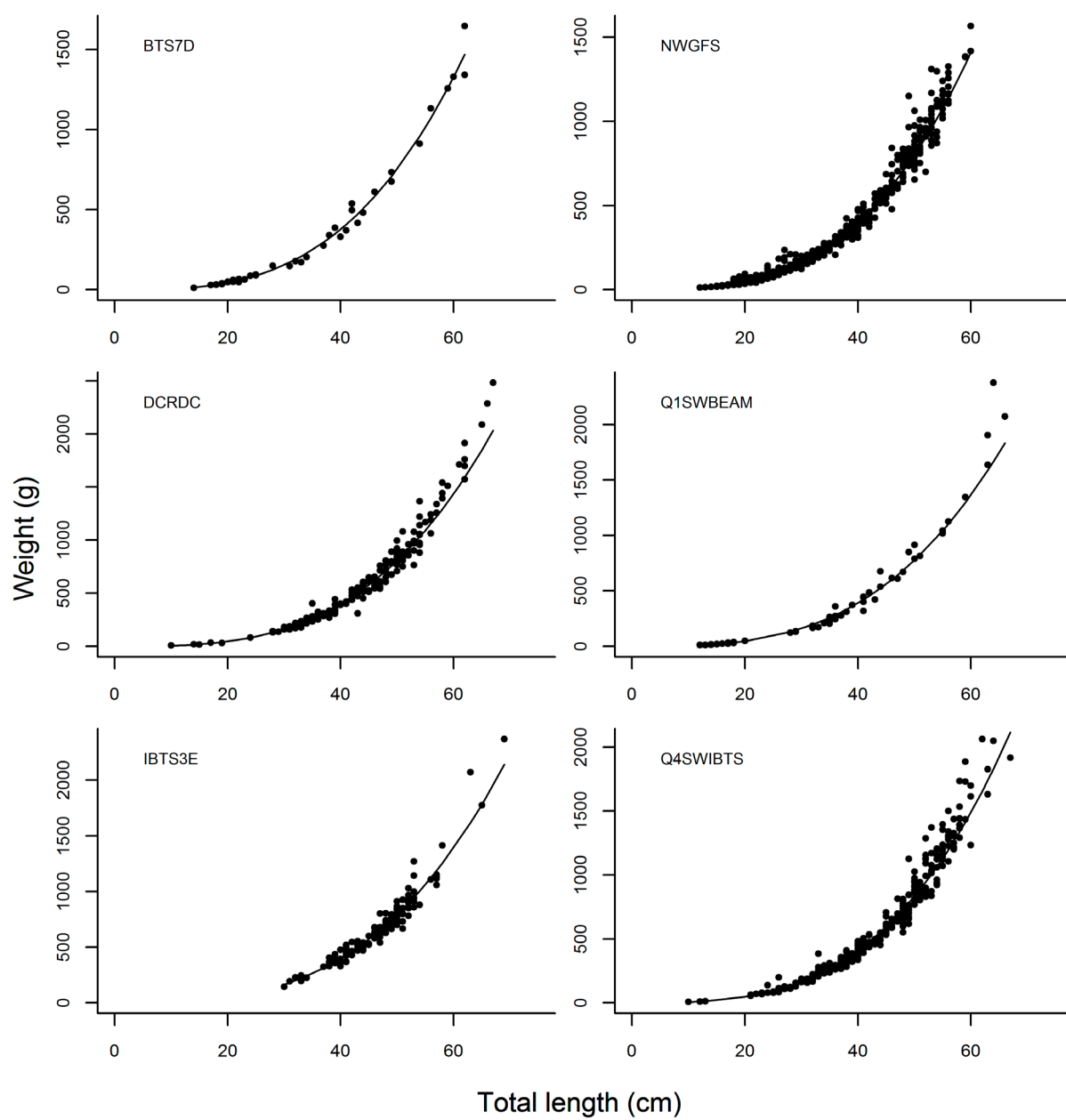


Figure 17: *Leucoraja fullonica* Shagreen ray

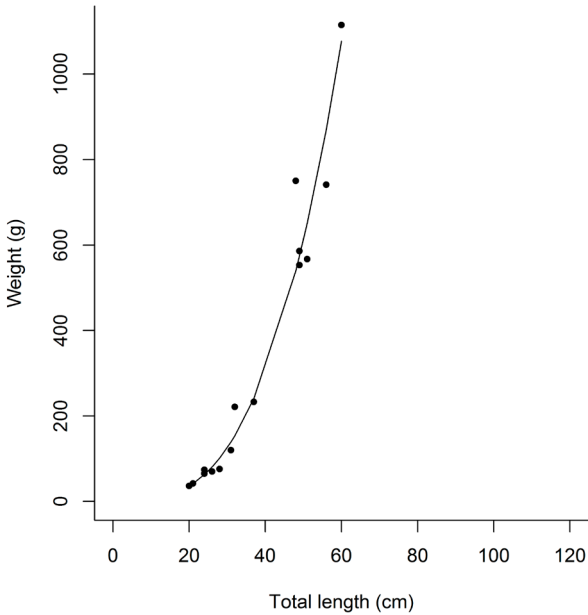


Figure 18: *Raja microocellata* Small-eyed ray

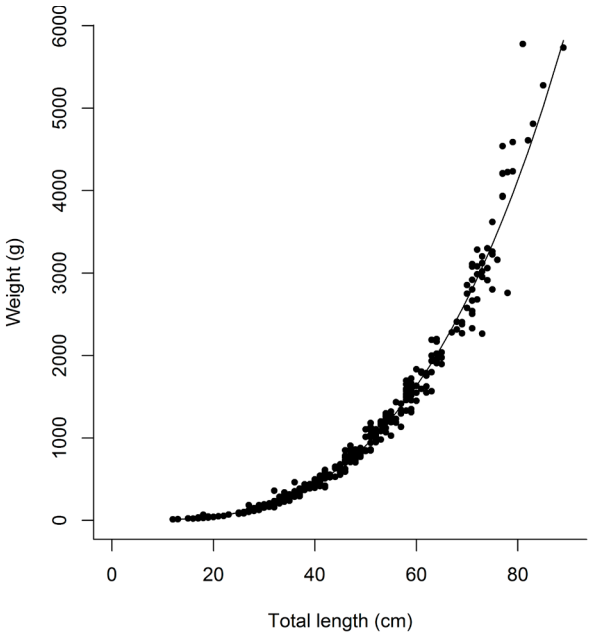


Figure 19: *Raja undulata* Undulate ray

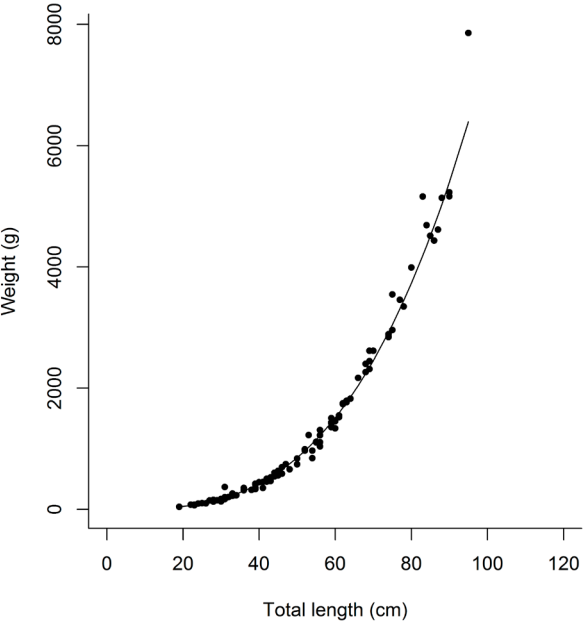


Figure 20: *Conger conger* European conger eel

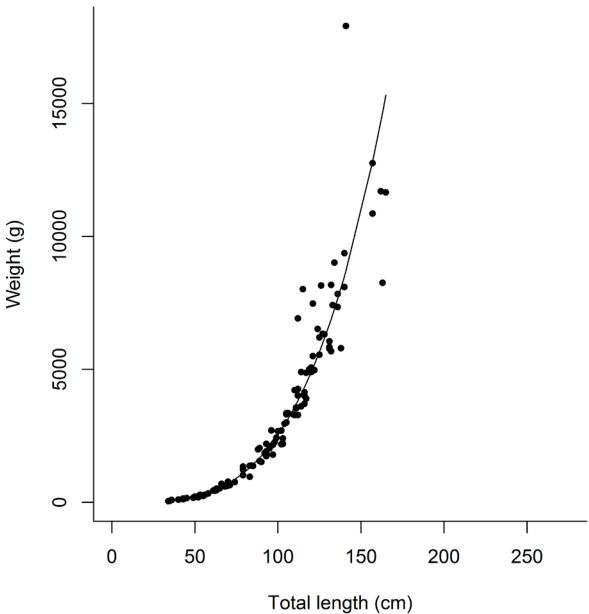


Figure 21: *Clupea harengus* Herring

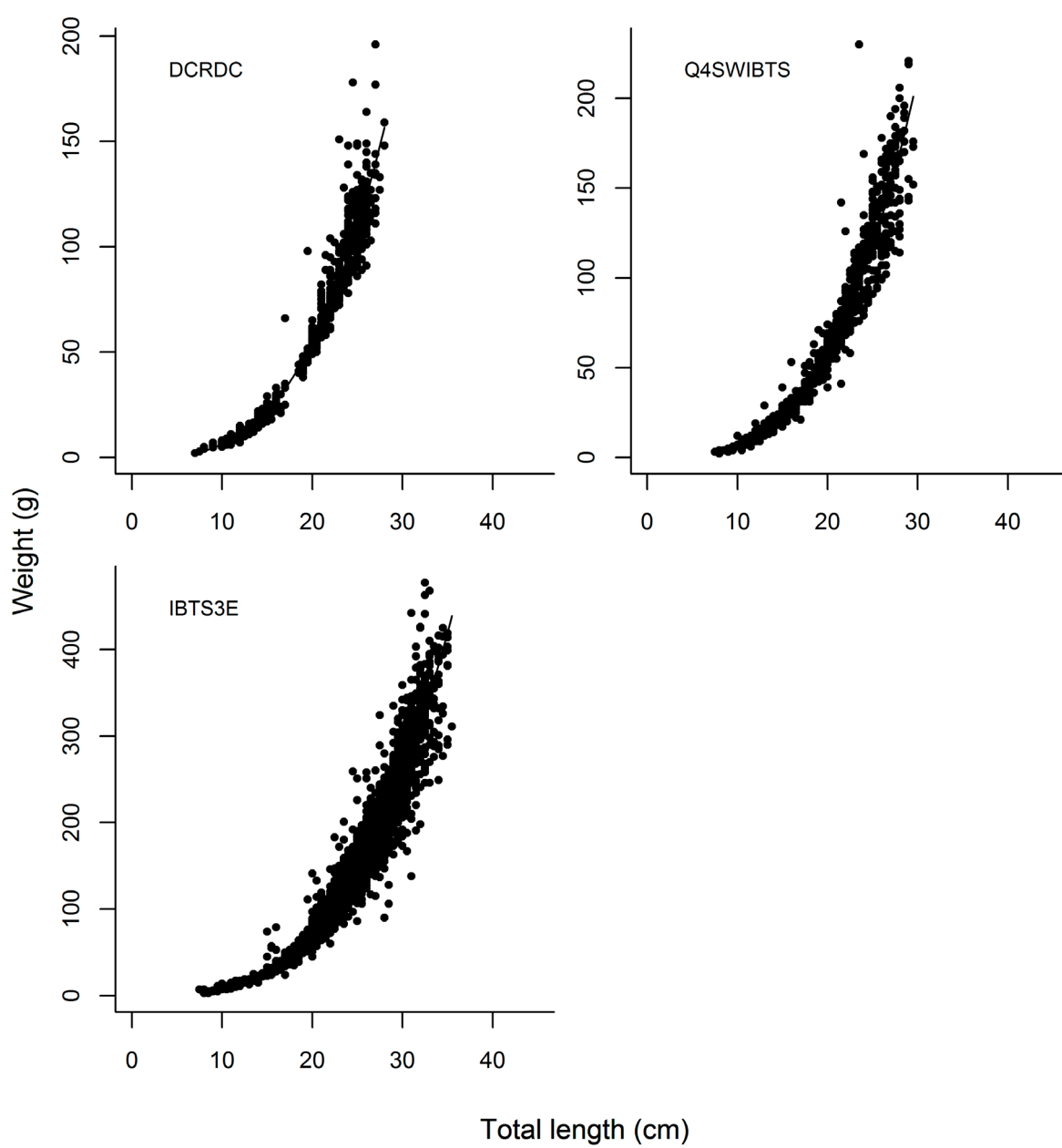


Figure 22: *Sprattus sprattus* Sprat

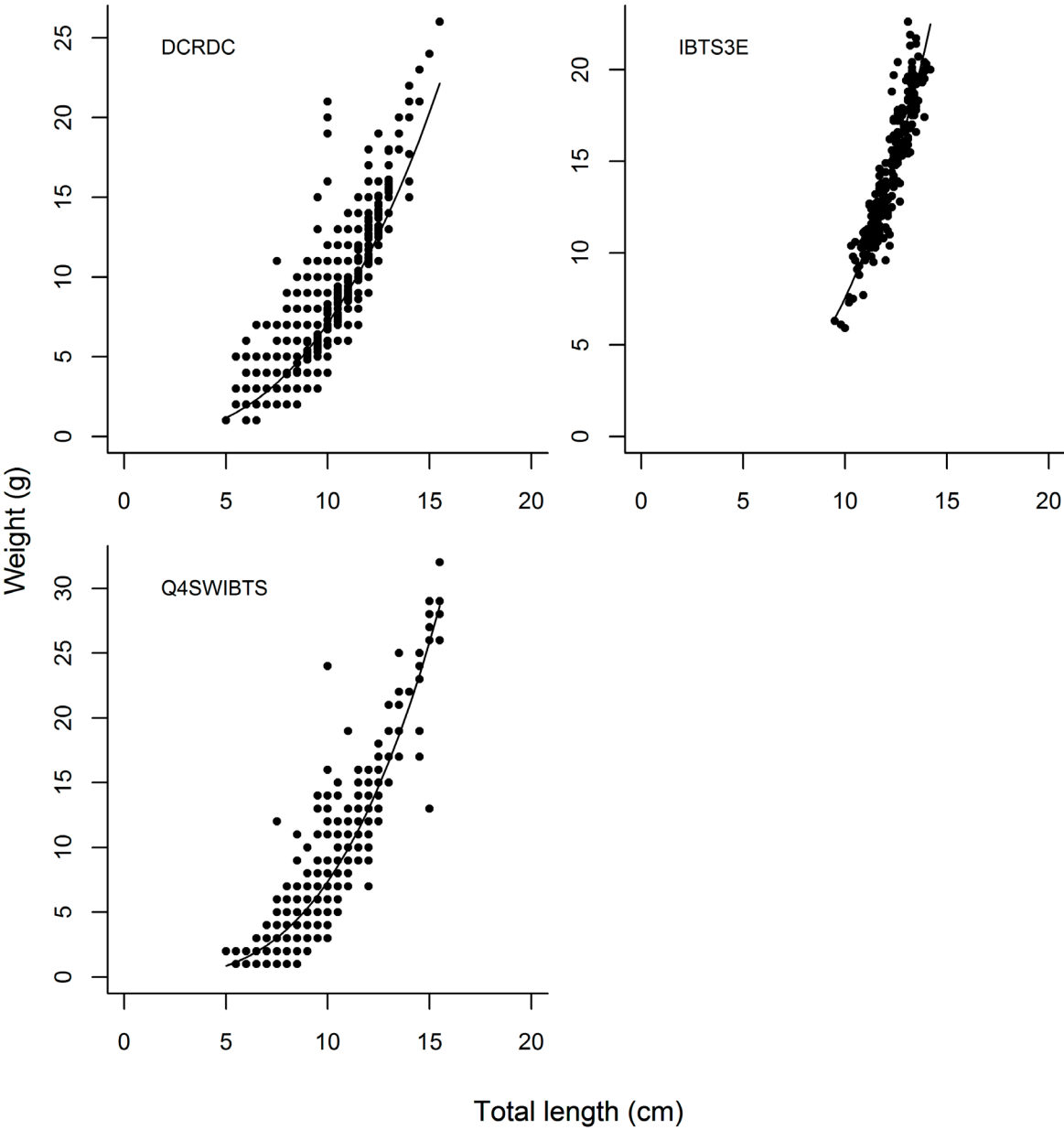


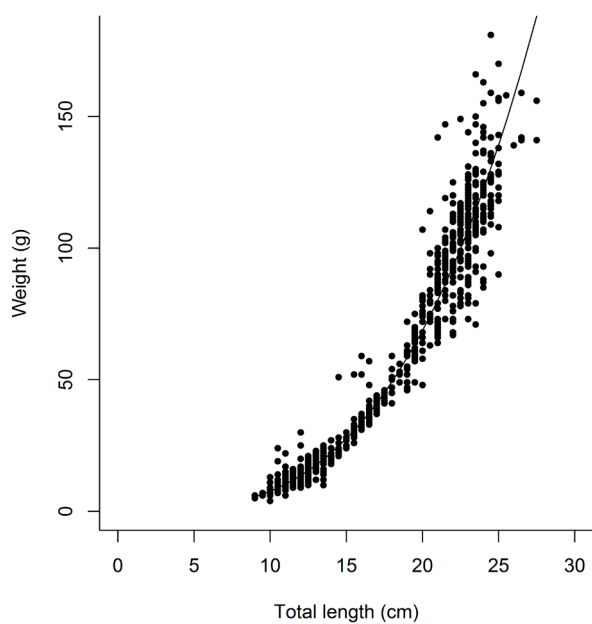
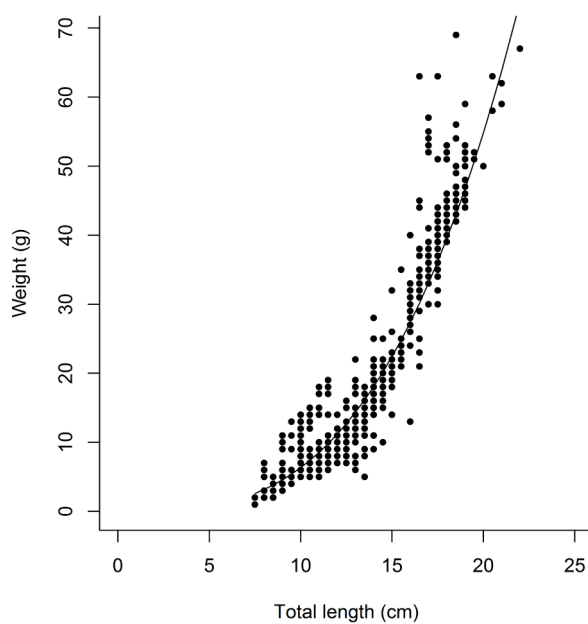
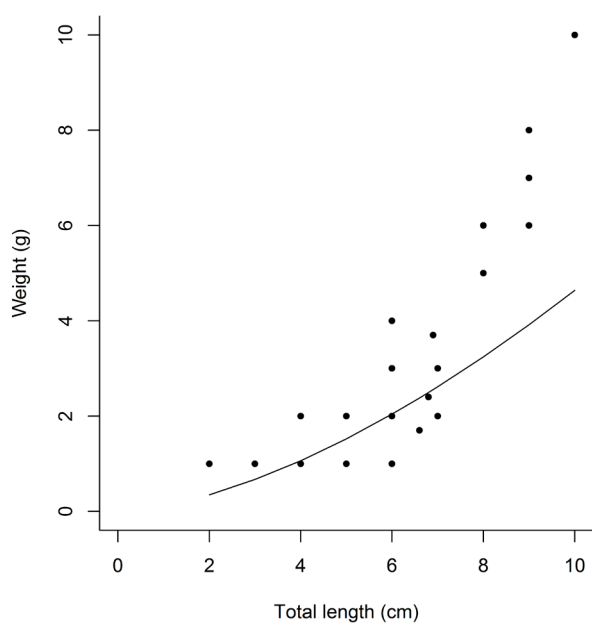
Figure 23: *Sardina pilchardus* Pilchard**Figure 24:** *Engraulis encrasicolus* European anchovy**Figure 25:** *Maurolicus muelleri* Pearlside

Figure 26: *Argentina* spp. Argentine

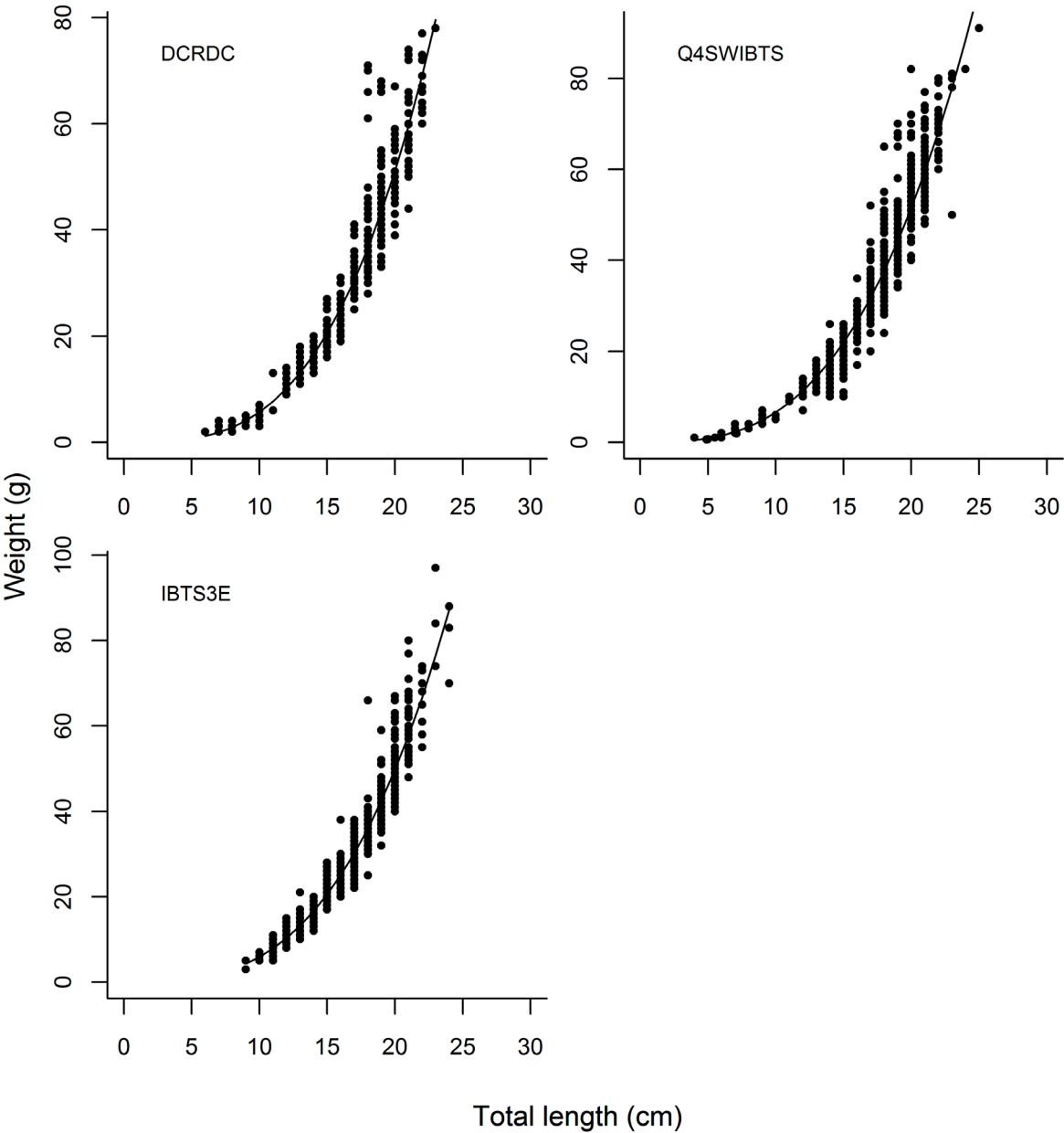


Figure 27: *Gadiculus argenteus* Silvery pout

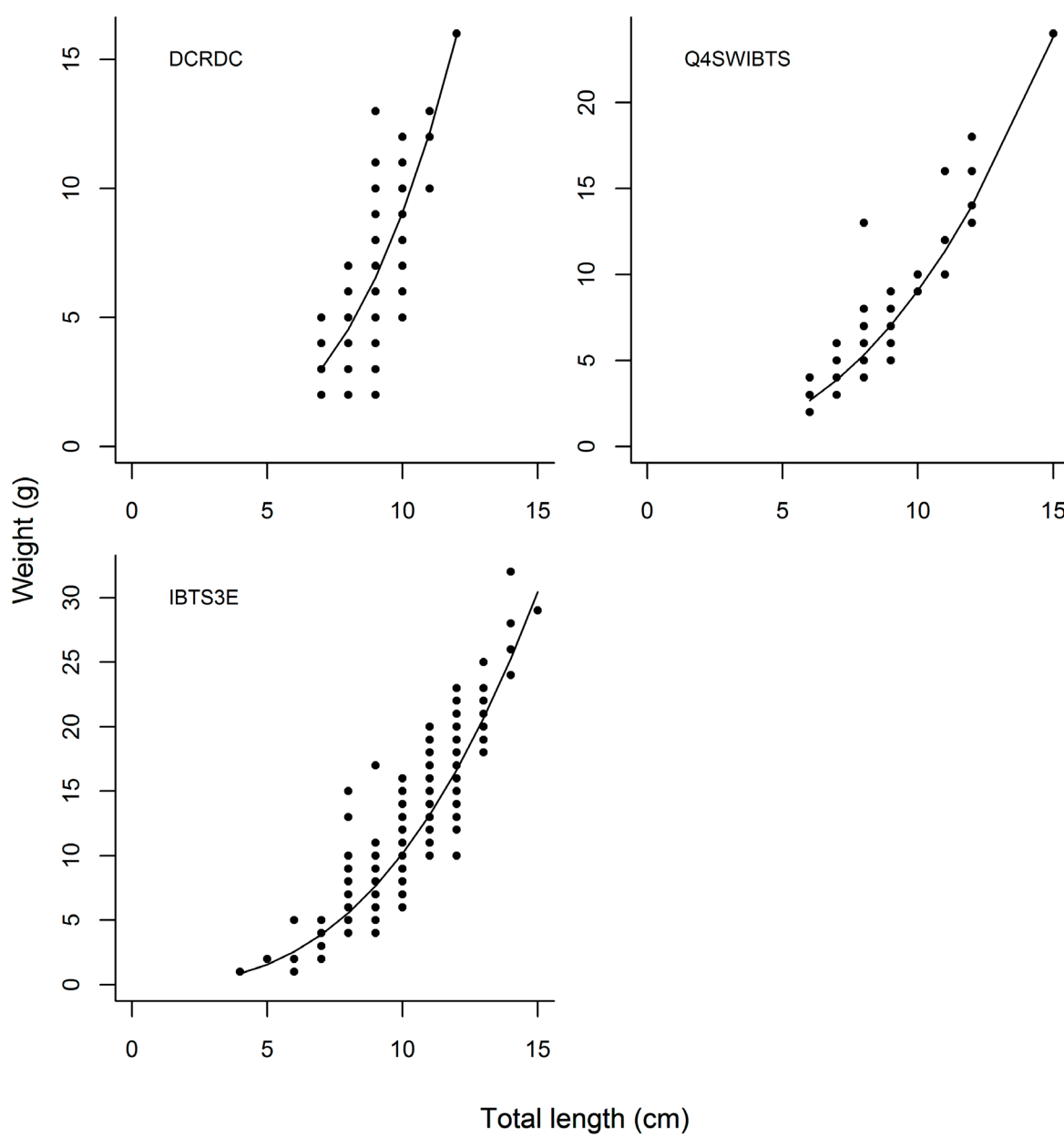


Figure 28: *Gadus morhua* Cod

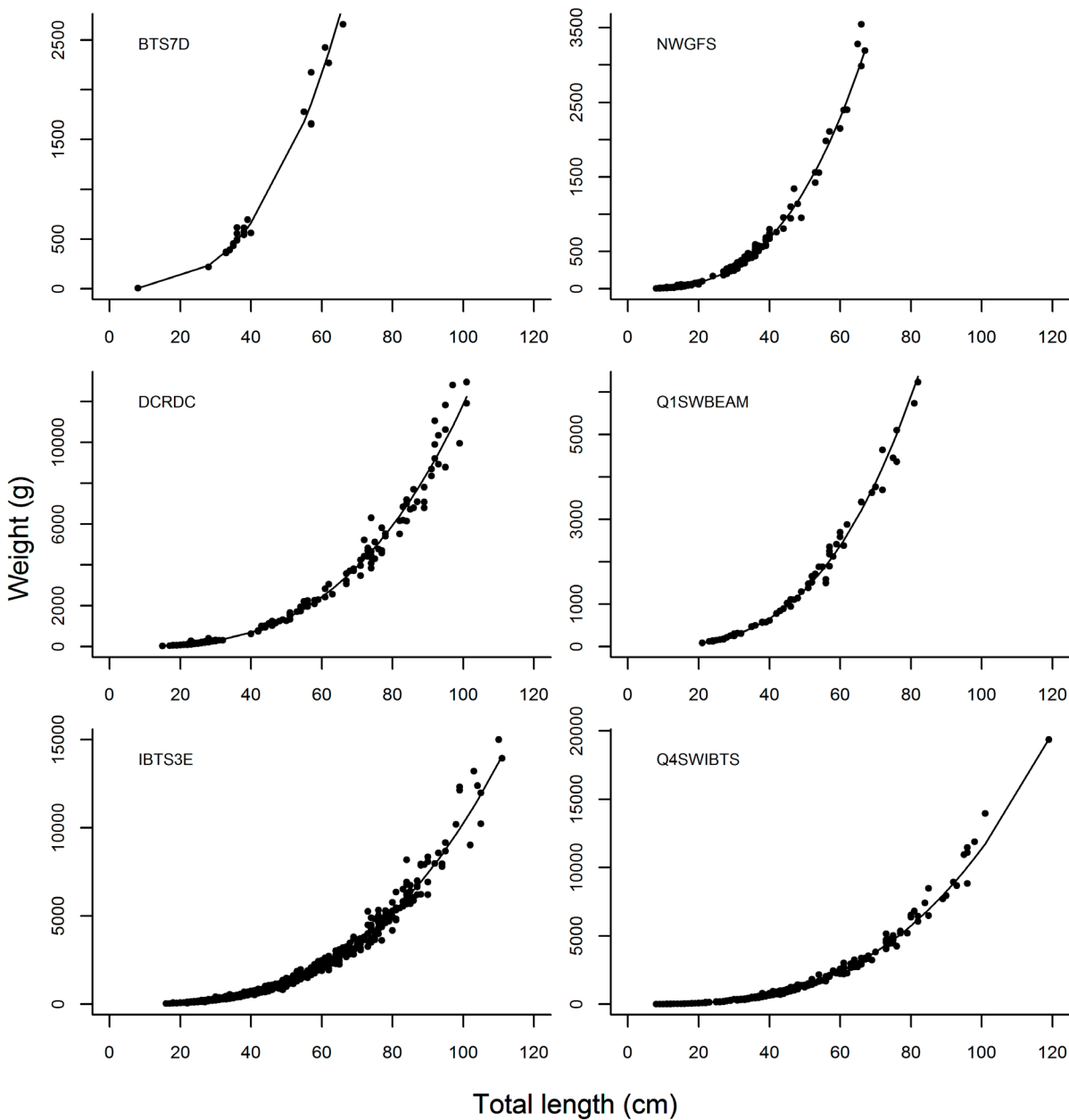


Figure 29: *Melanogrammus aeglefinus* Haddock

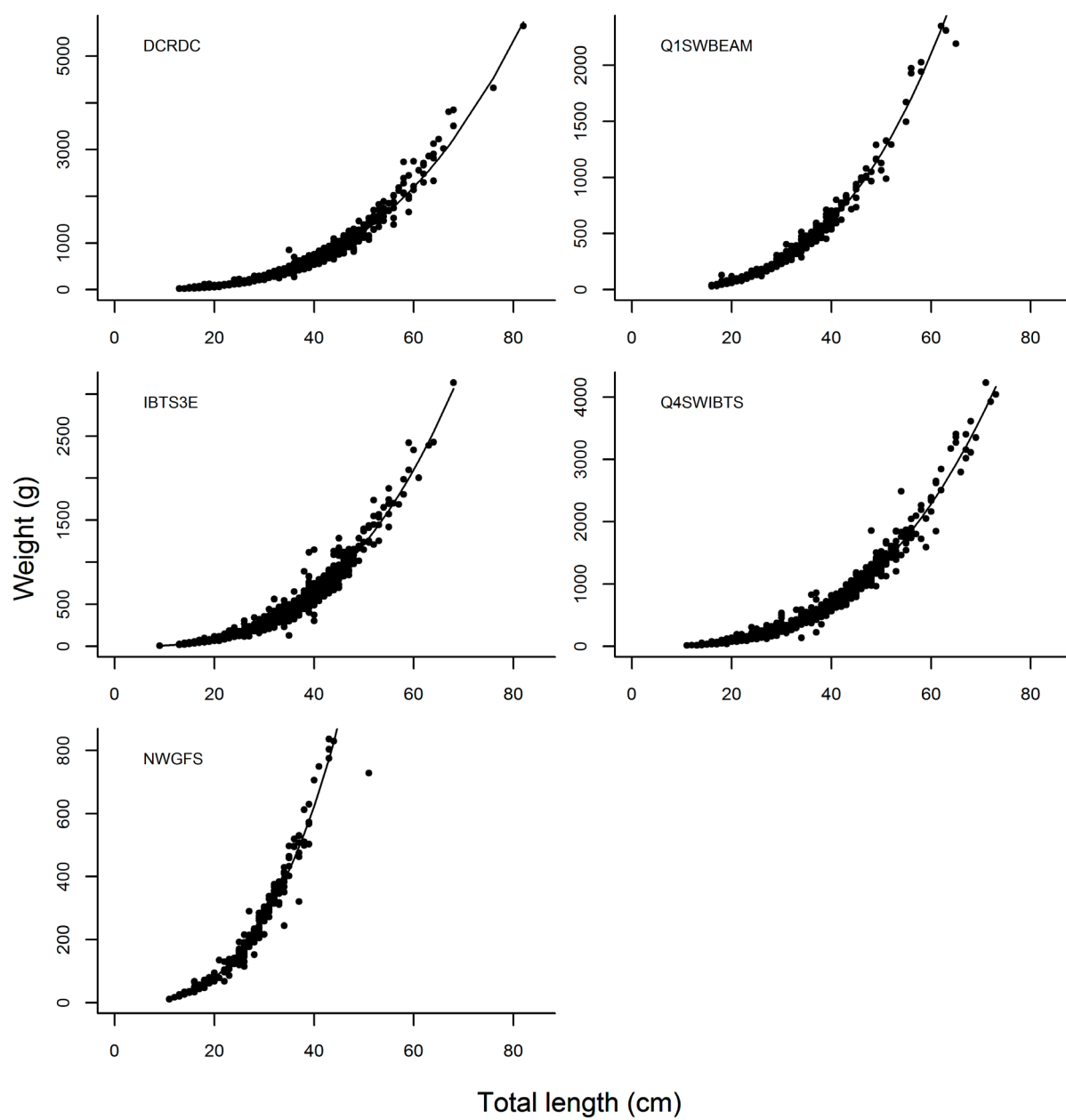


Figure 30: *Merlangius merlangus* Whiting

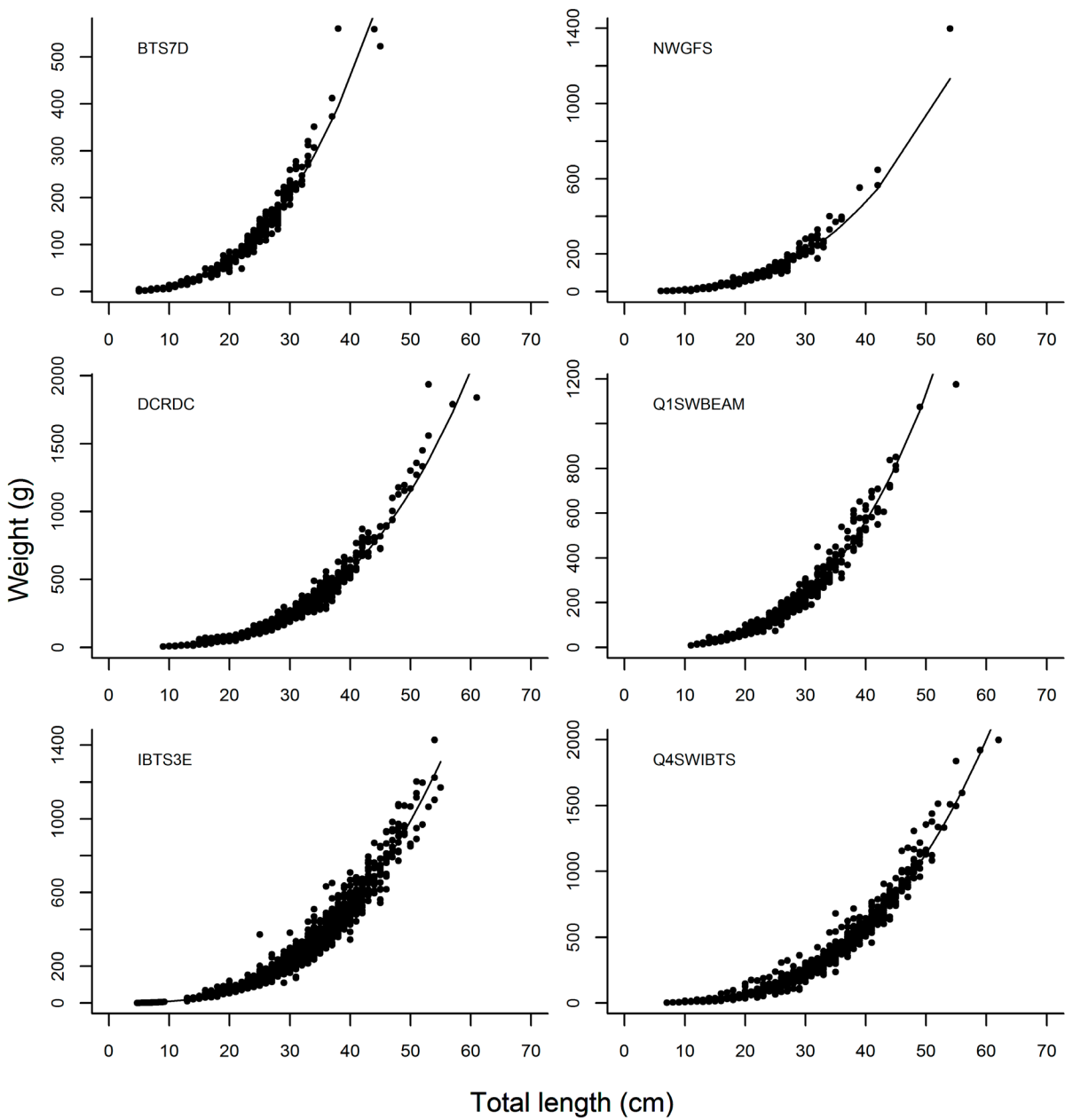


Figure 31: *Micromesistius poutassou* Blue whiting

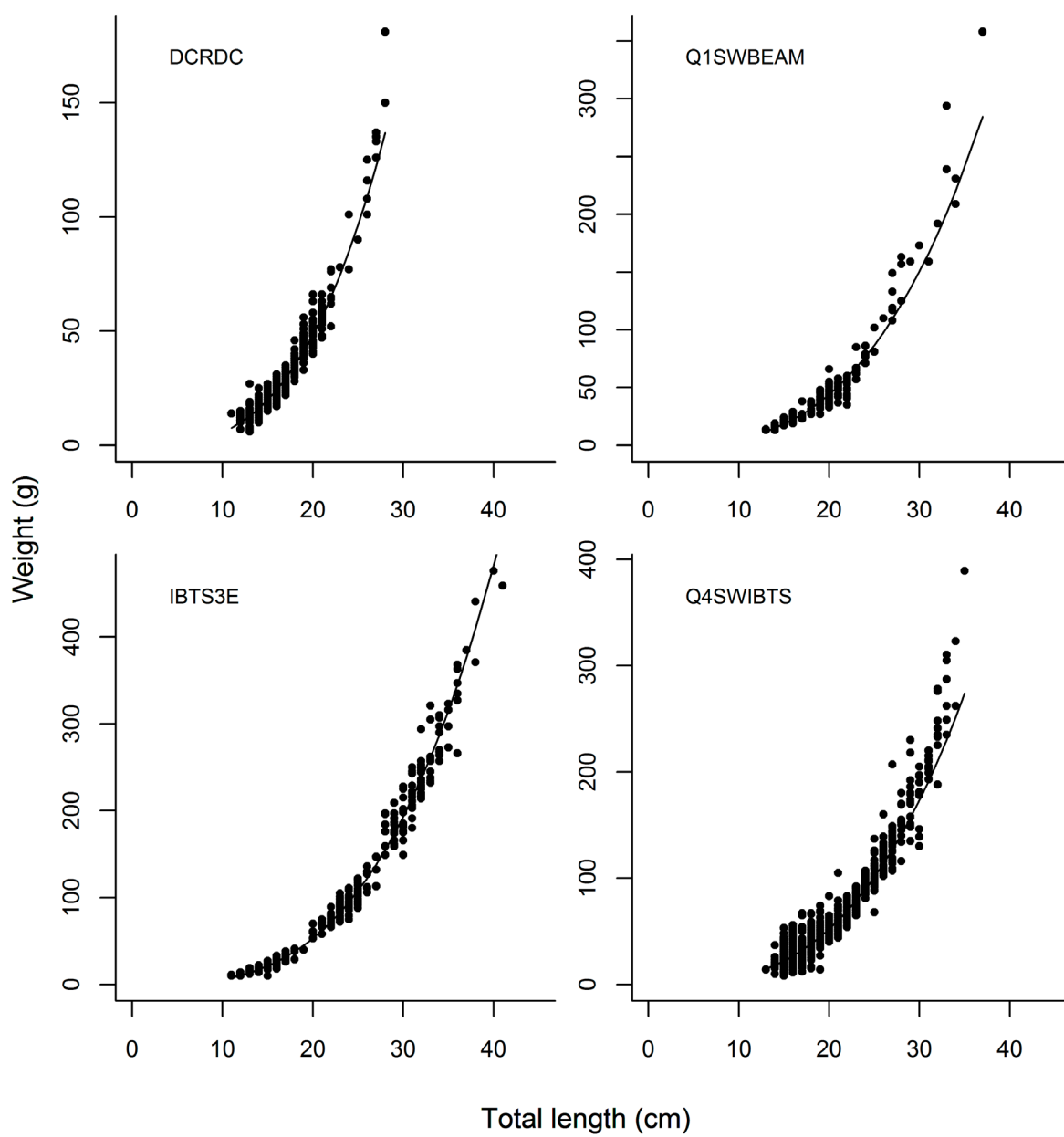


Figure 32: *Pollachius pollachius* Pollack

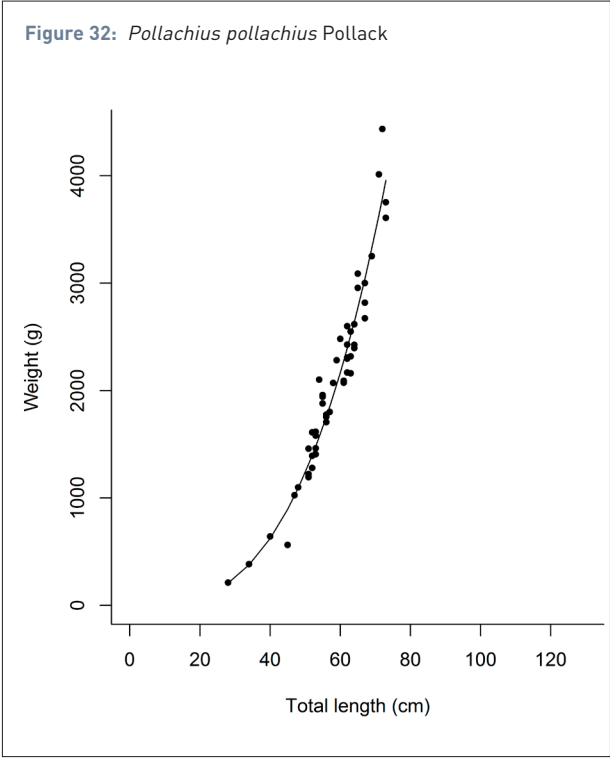


Figure 33: *Pollachius virens* Saithe

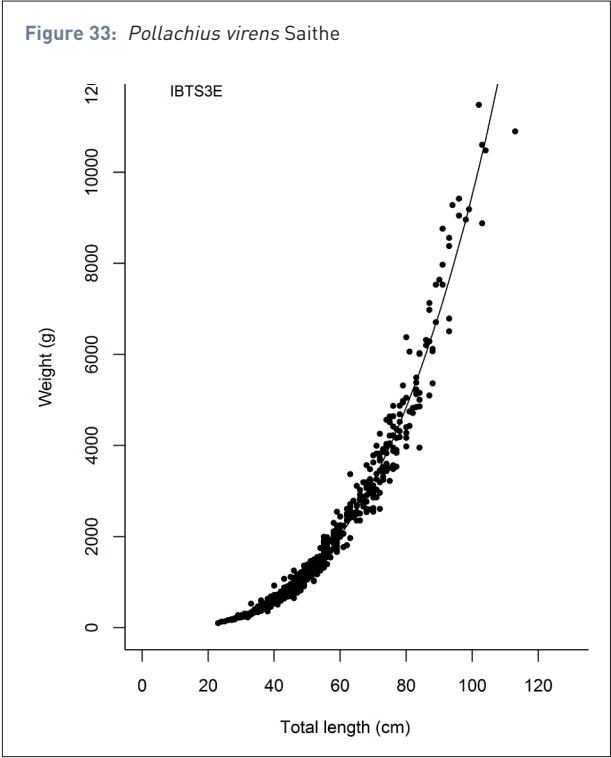


Figure 34: *Ciliata mustela* Five-bearded rockling

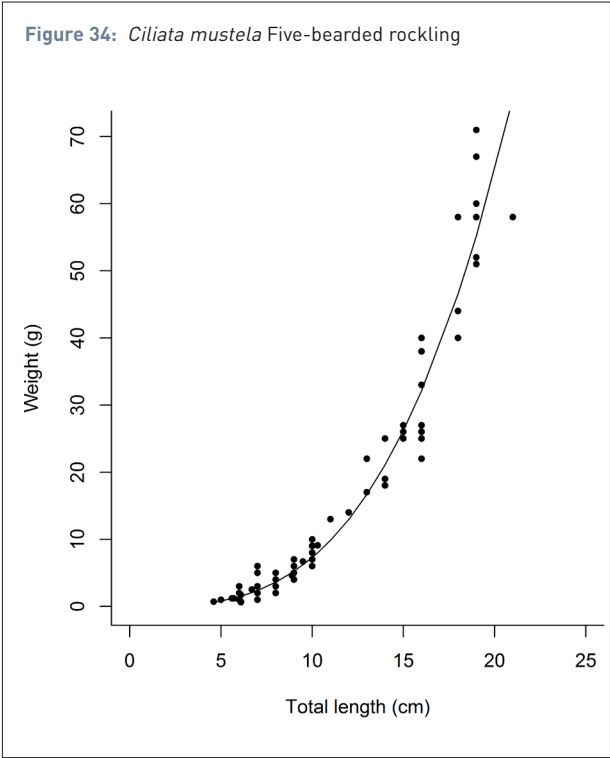


Figure 35: *Ciliata septentrionalis* Northern rockling

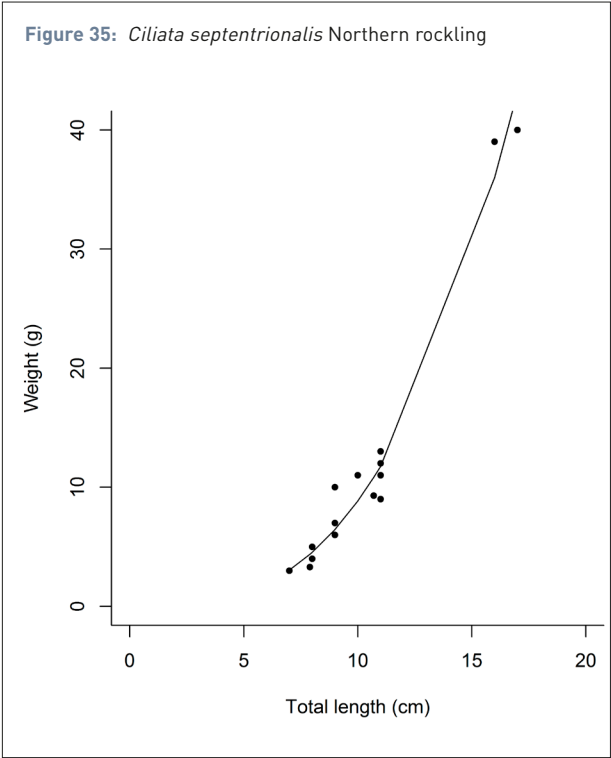


Figure 36: *Tripterus esmarki* Norway pout

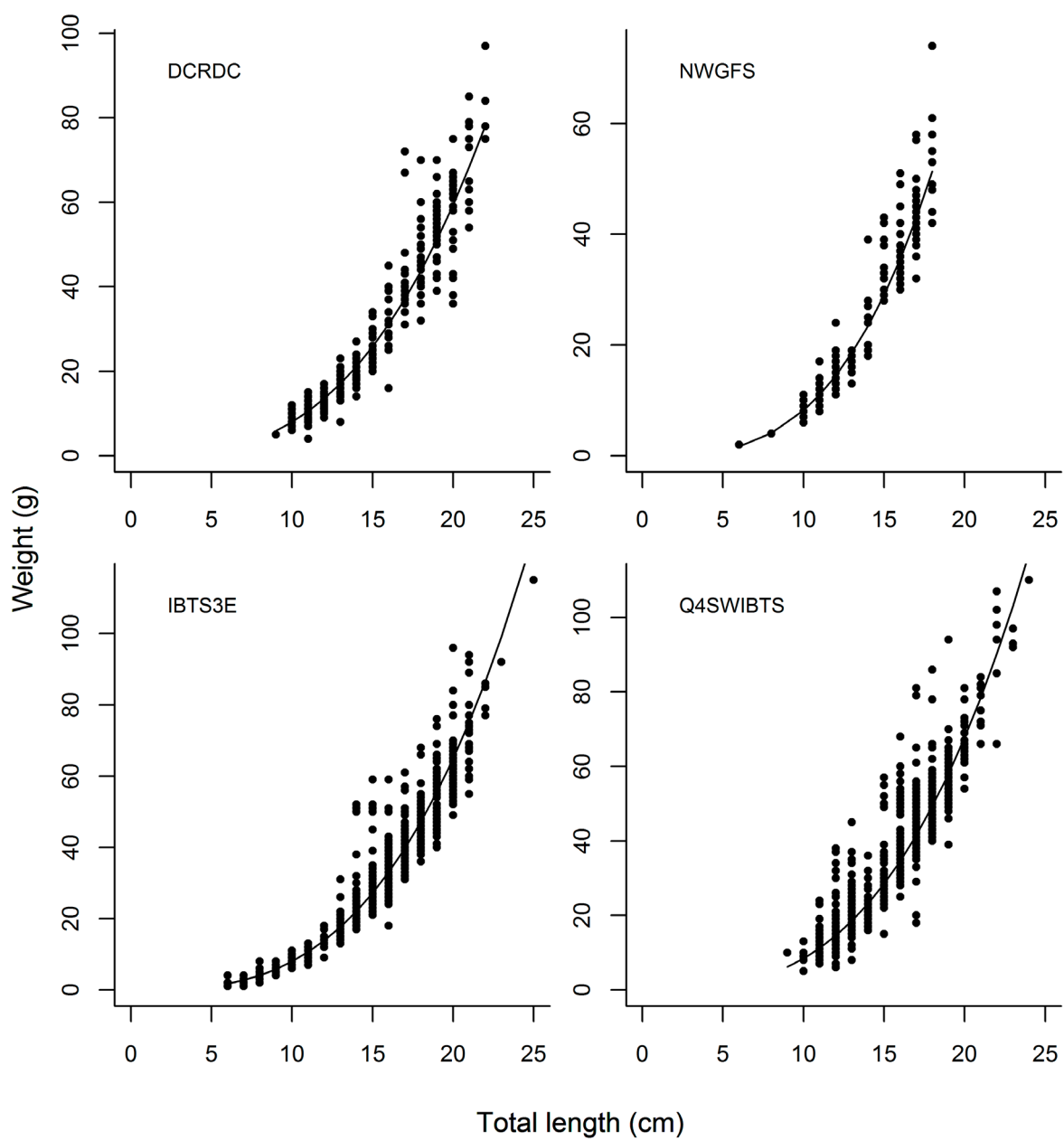


Figure 37: *Triptopterus luscus* Bib

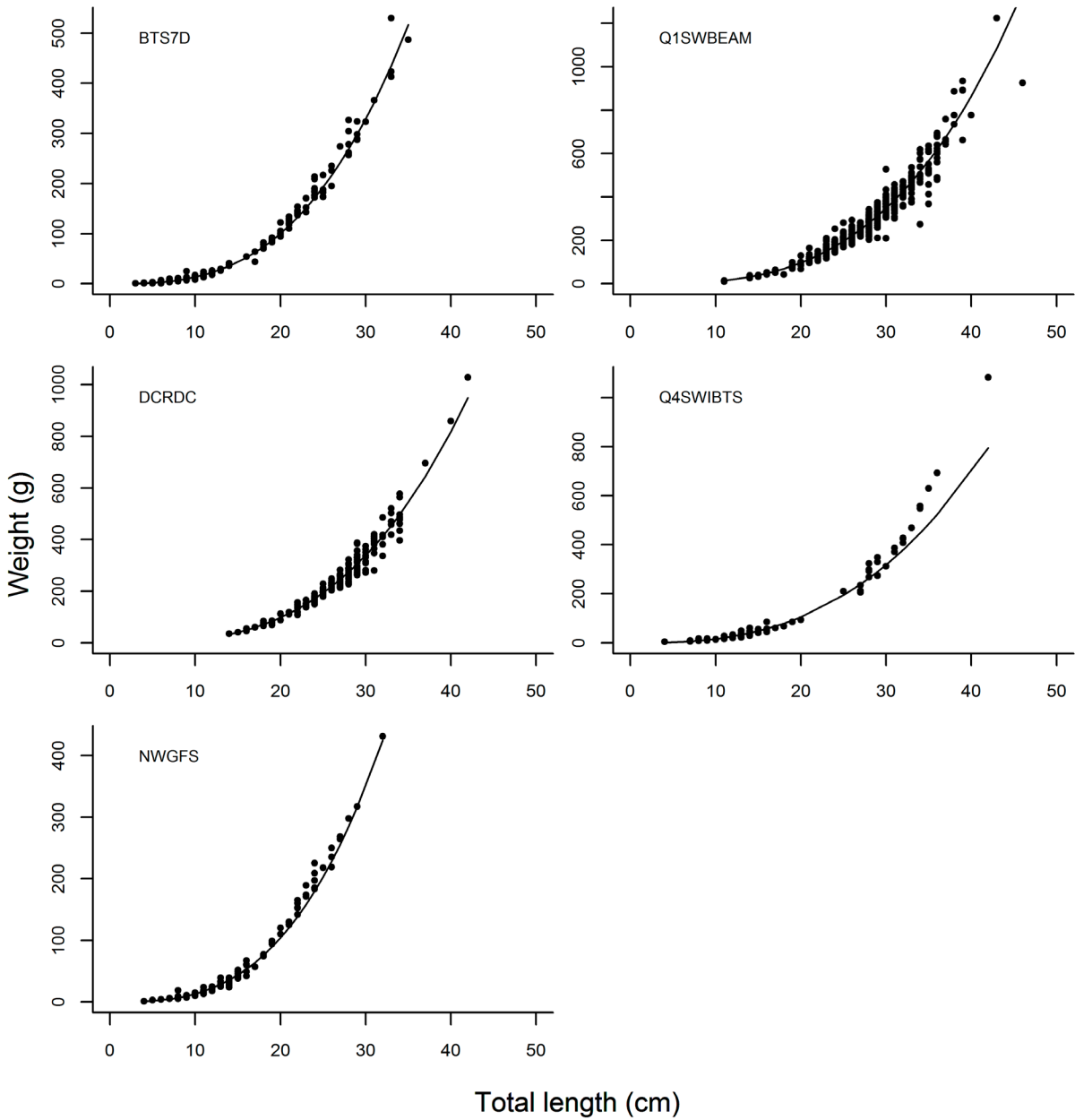


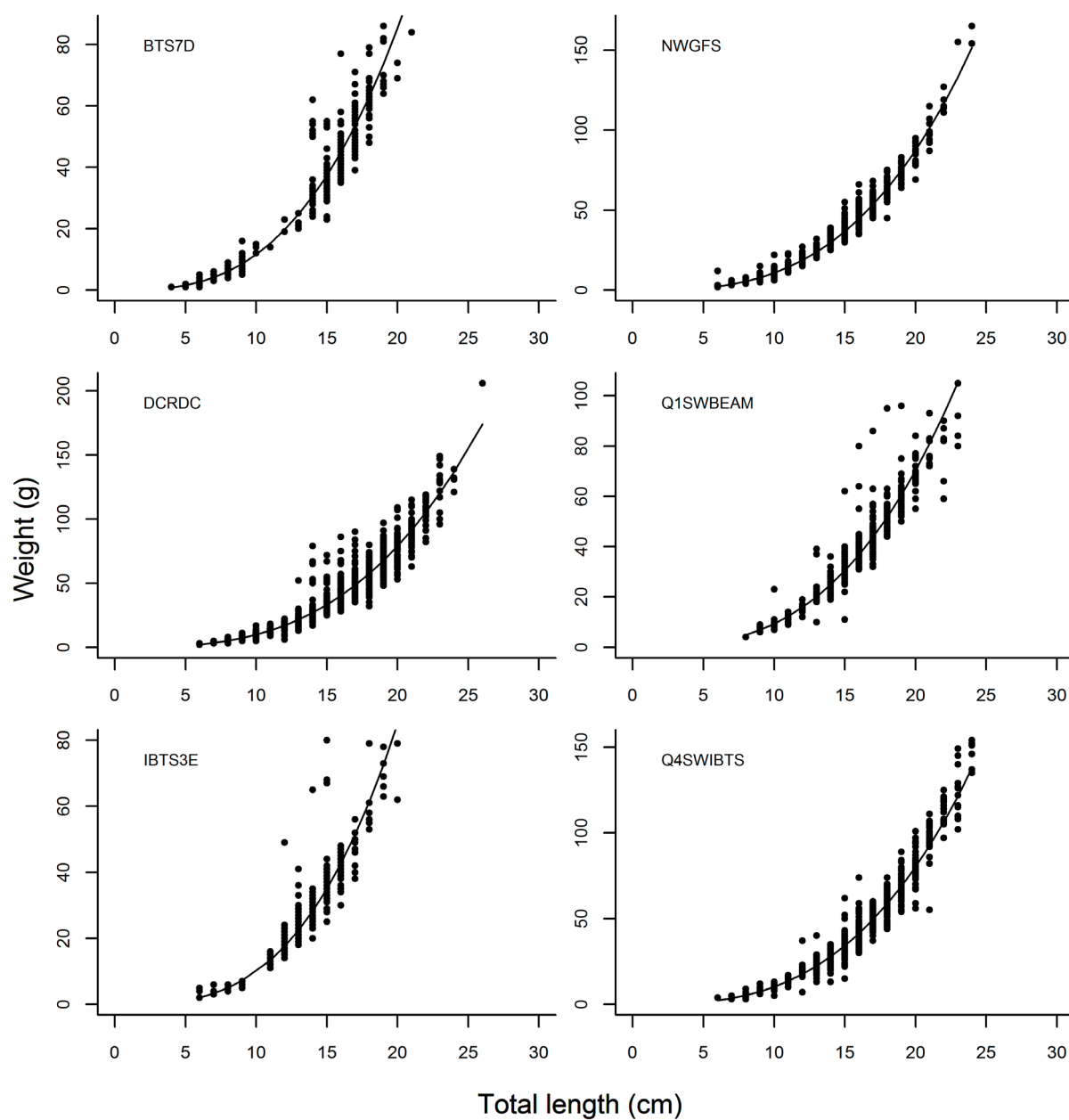
Figure 38: *Trisopterus minutus* Poor cod

Figure 39: *Enchelyopus cimbrius* Four-bearded rockling

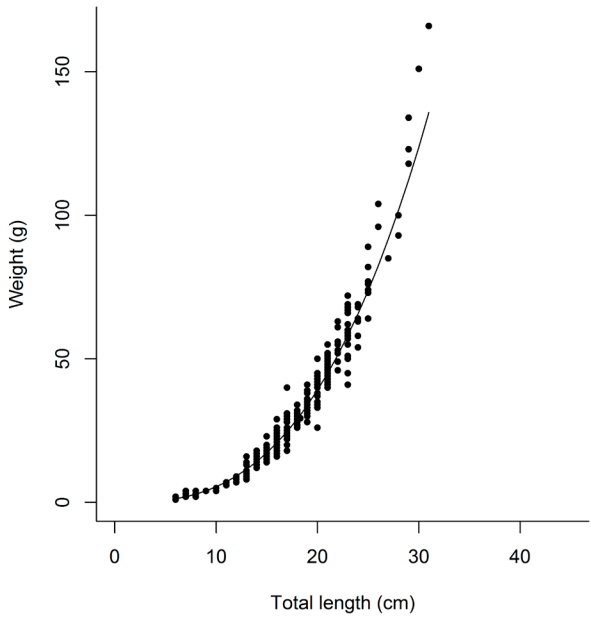


Figure 40: *Gaidropsarus mediterraneus* Shore rockling

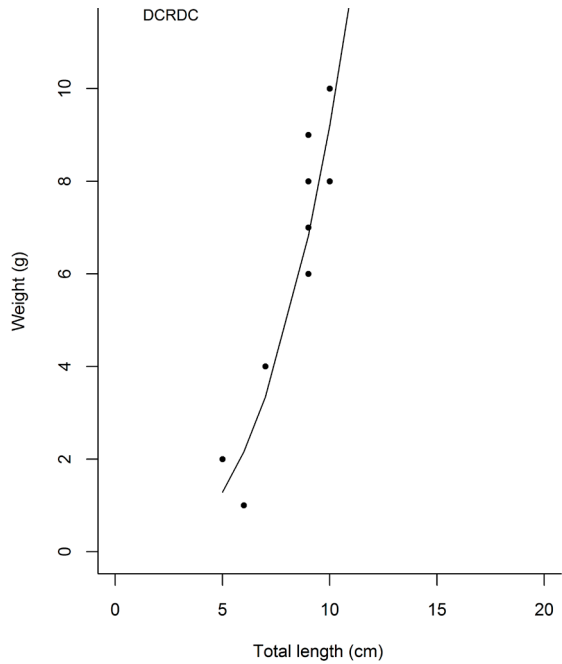


Figure 41: *Gaidropsarus vulgaris* Three-bearded rockling

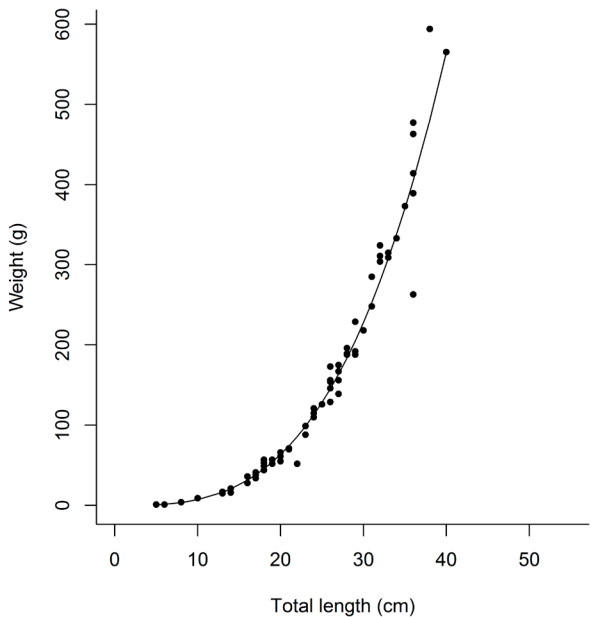


Figure 42: *Molva molva* Ling

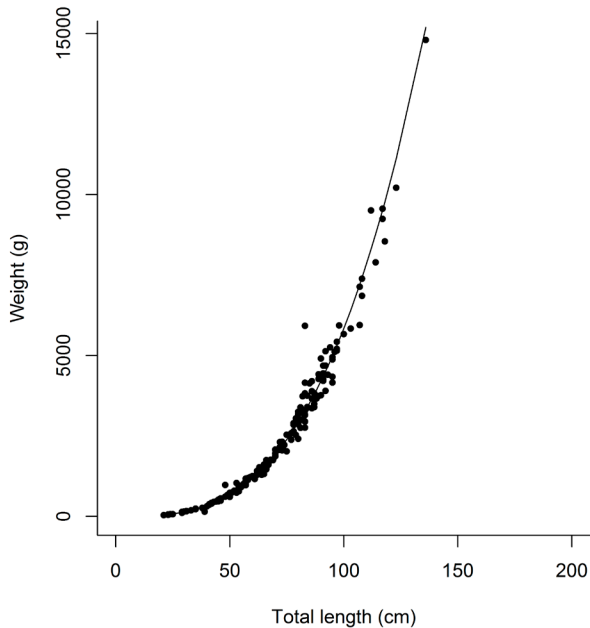


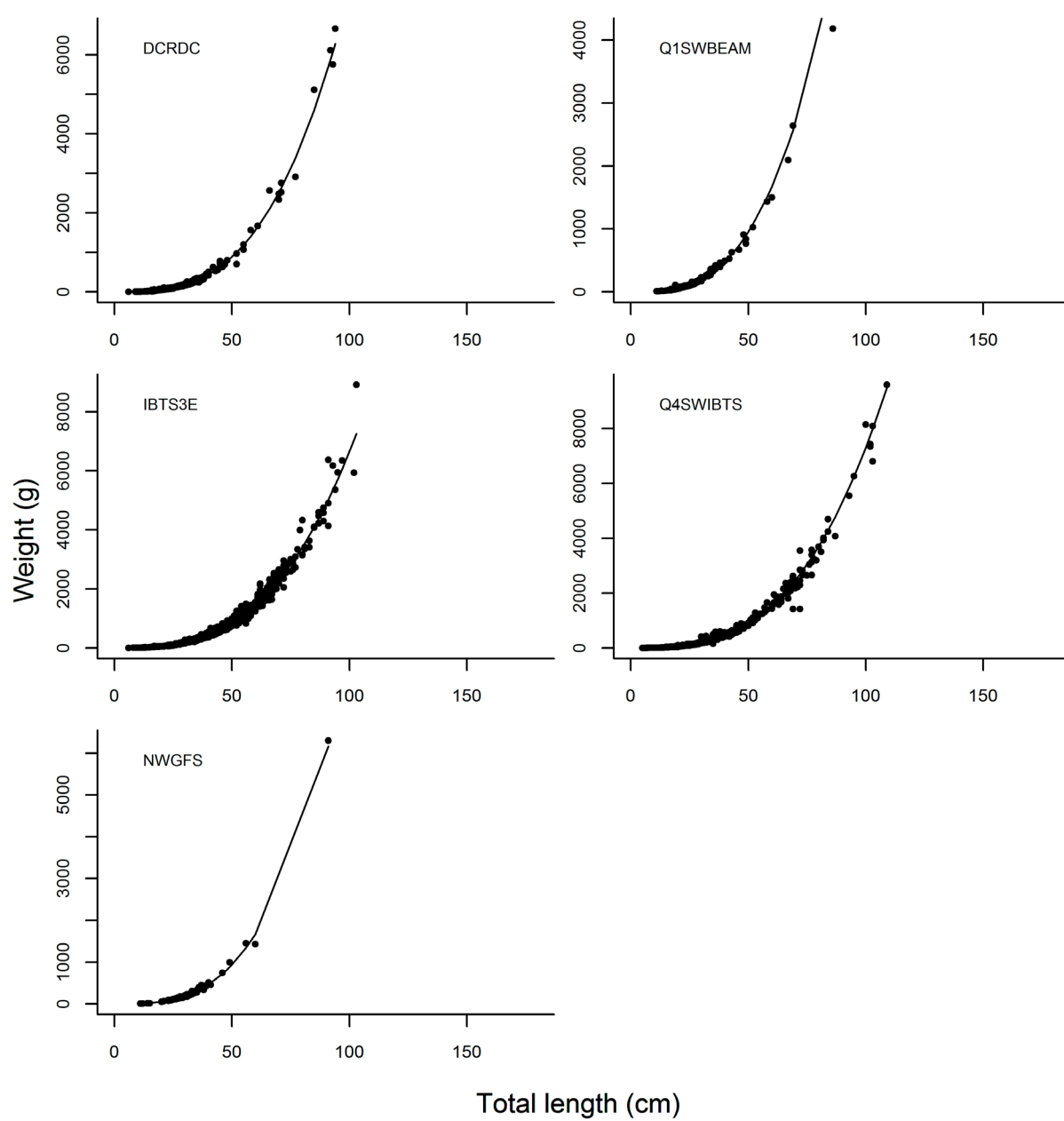
Figure 43: *Merluccius merluccius* European hake

Figure 44: *Lophius piscatorius* Anglerfish

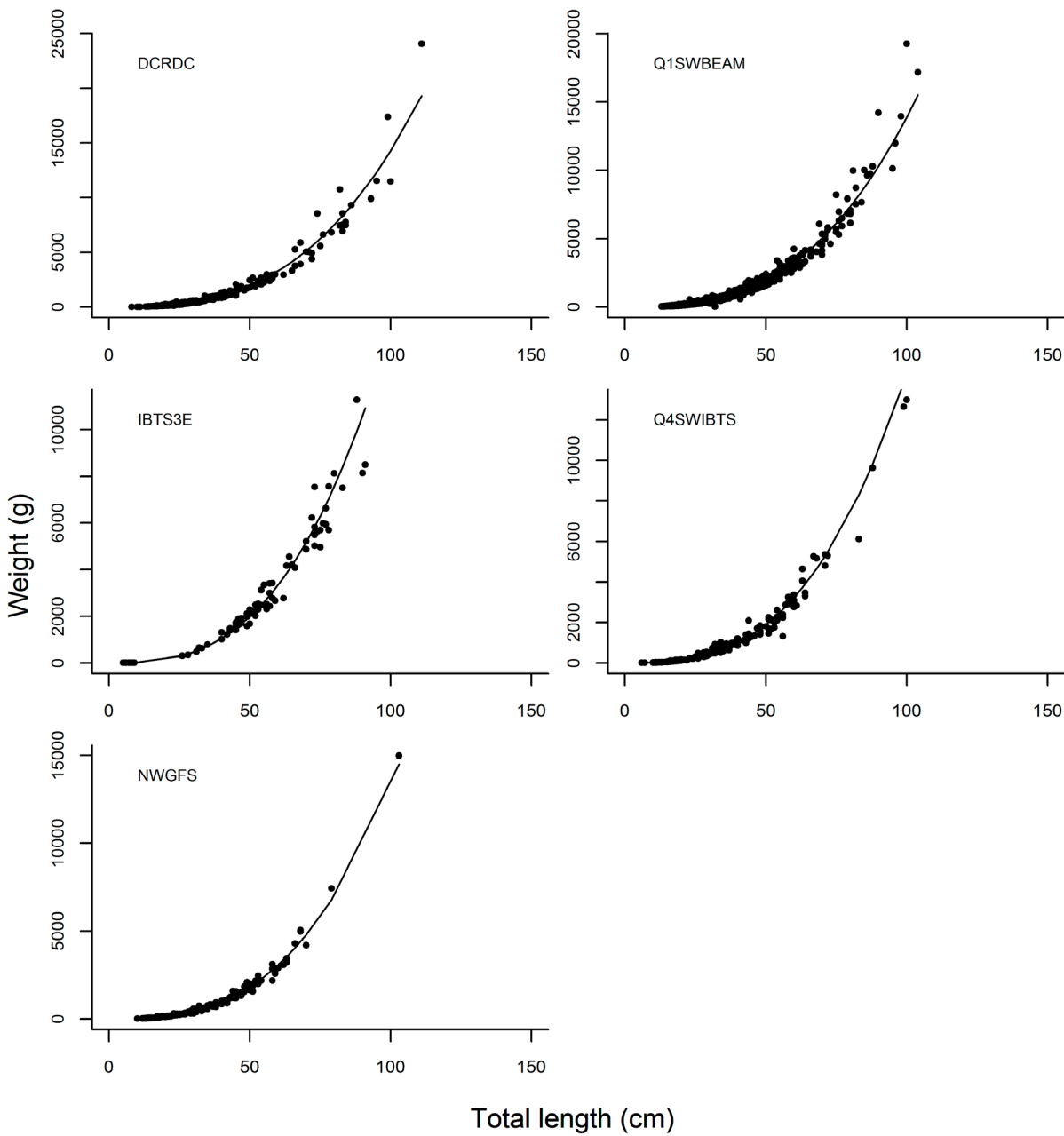


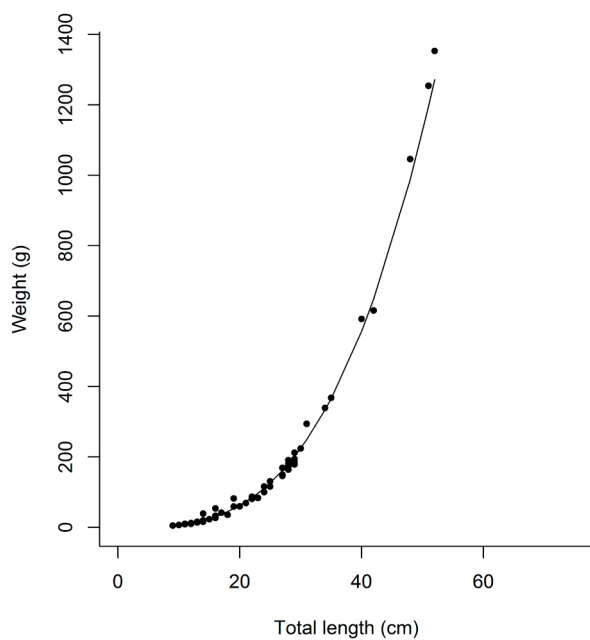
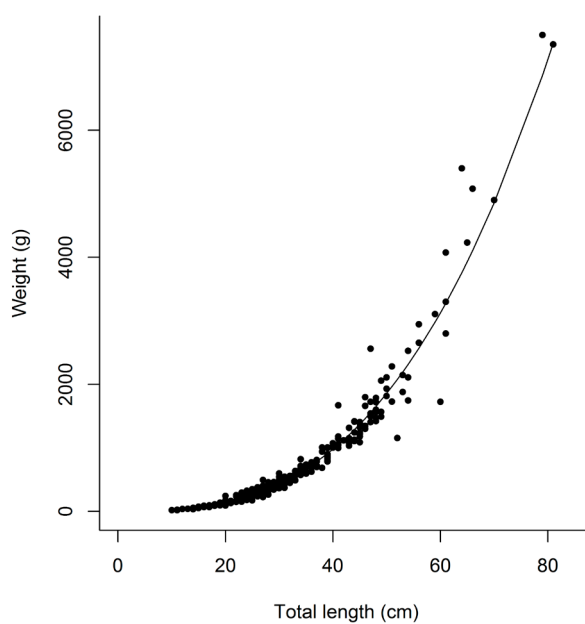
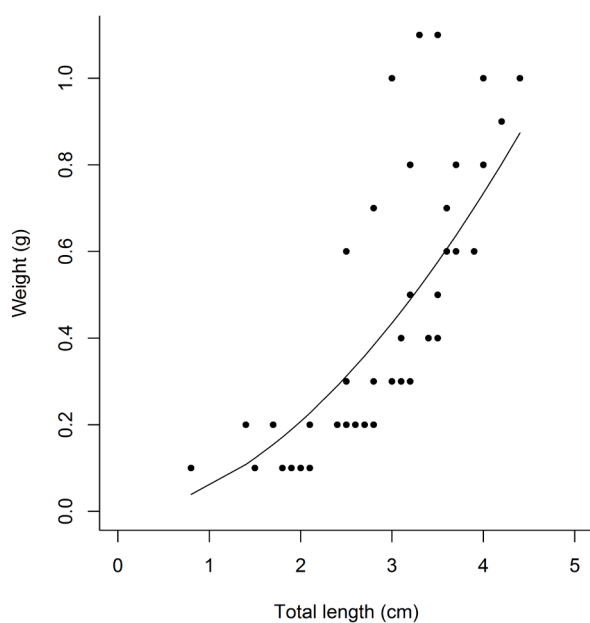
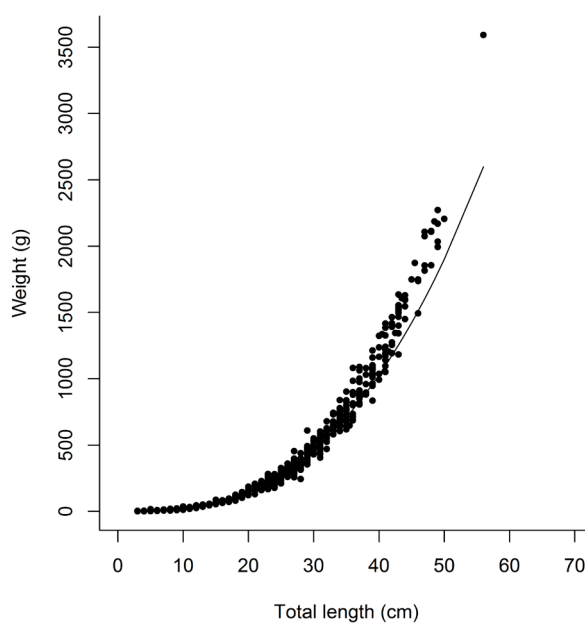
Figure 45: *Phycis blennoides* Greater forkbeard**Figure 46:** *Lophius budegassa* Black-bellied anglerfish**Figure 47:** *Diplecogaster bimaculata* Two-spotted clingfish**Figure 48:** *Zeus faber* John dory

Figure 49: *Capros aper* Boarfish

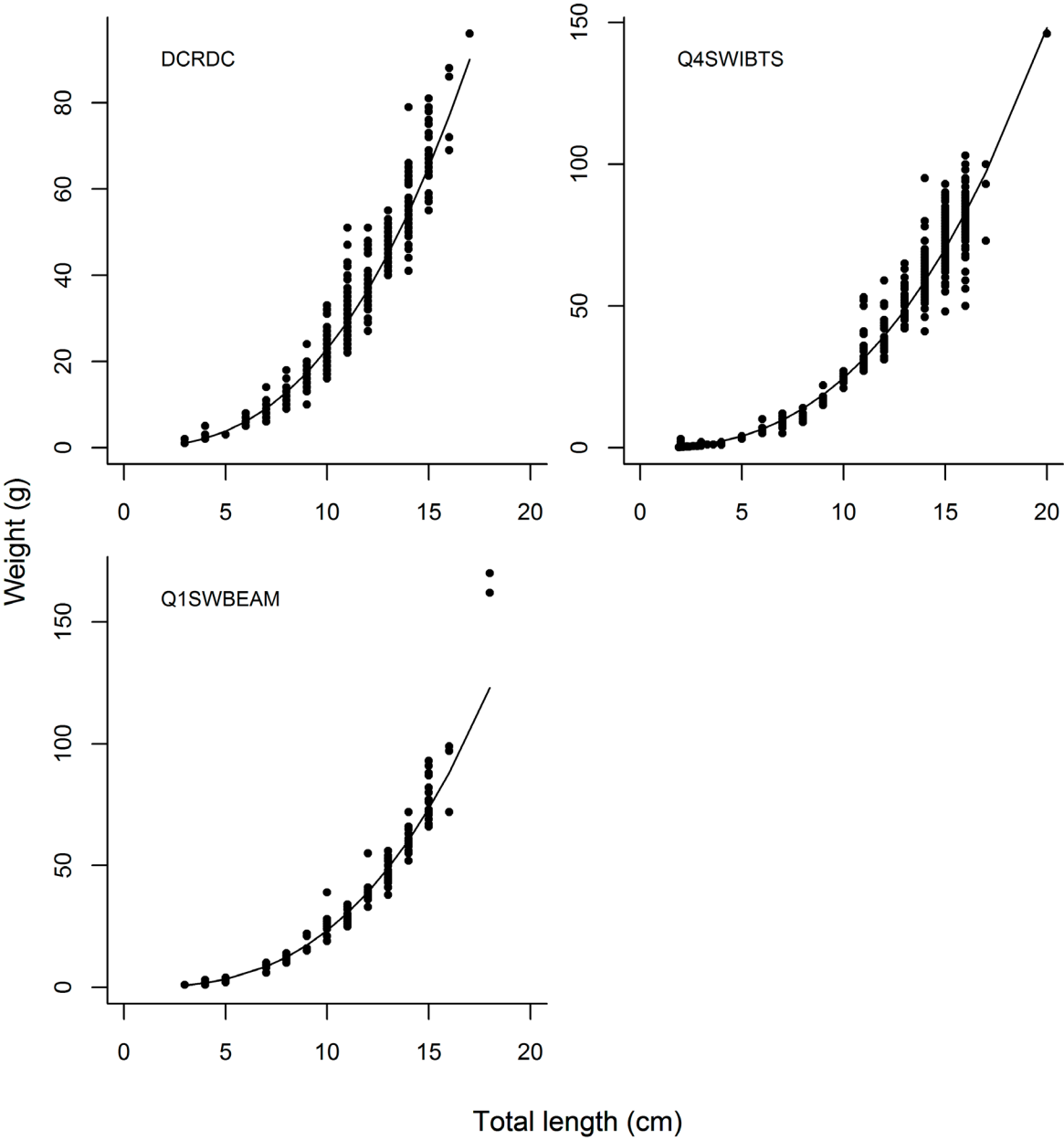


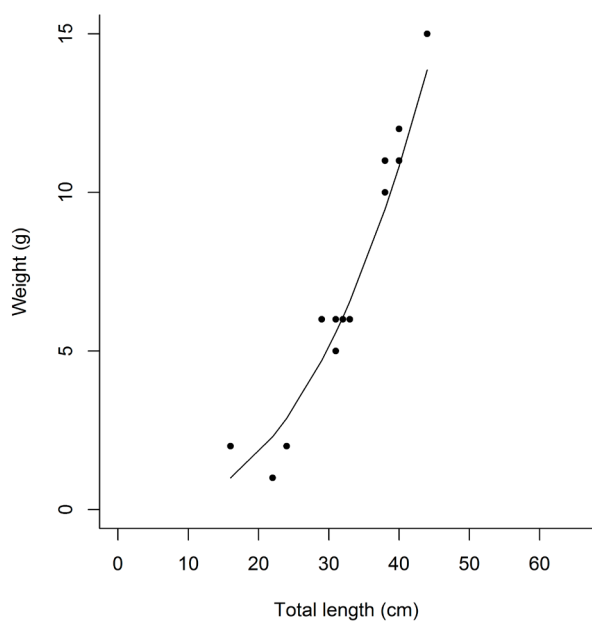
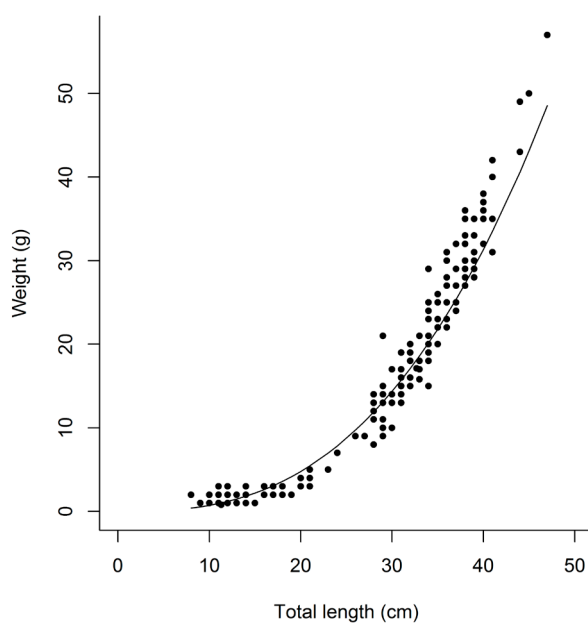
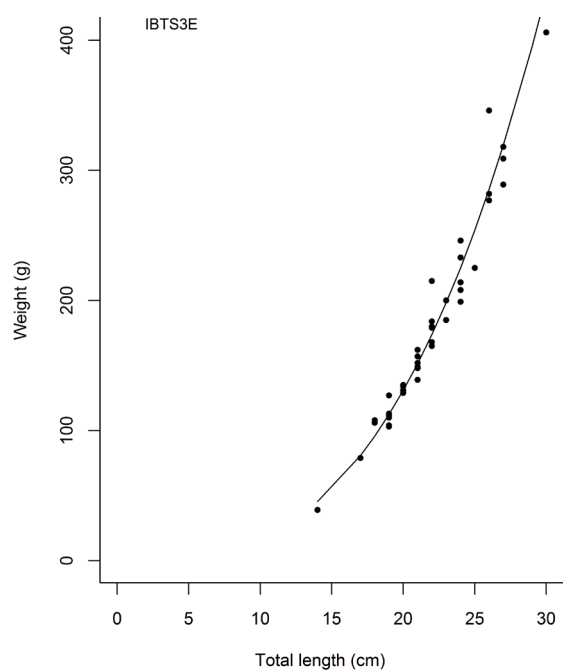
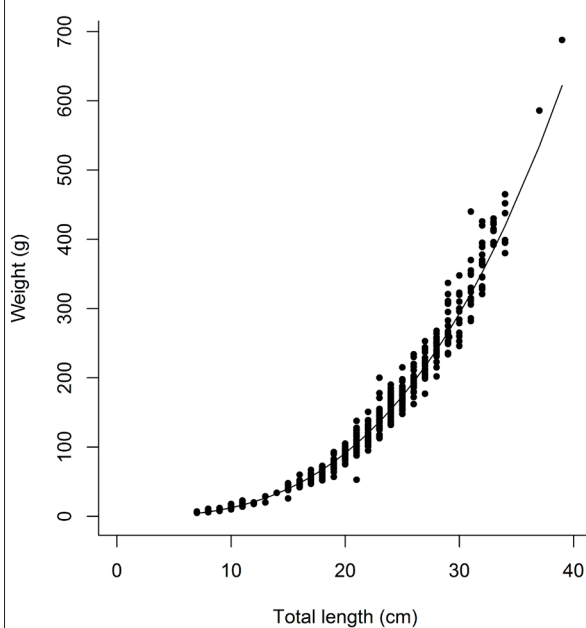
Figure 50: *Entelurus aequoreus* Snake pipefish**Figure 51:** *Syngnathus* spp. Pipefish**Figure 52:** *Sebastes* spp. Redfish**Figure 53:** *Trigloporus lastoviza* Streaked gurnard

Figure 54: *Aspitrigla cuculus* Red gurnard

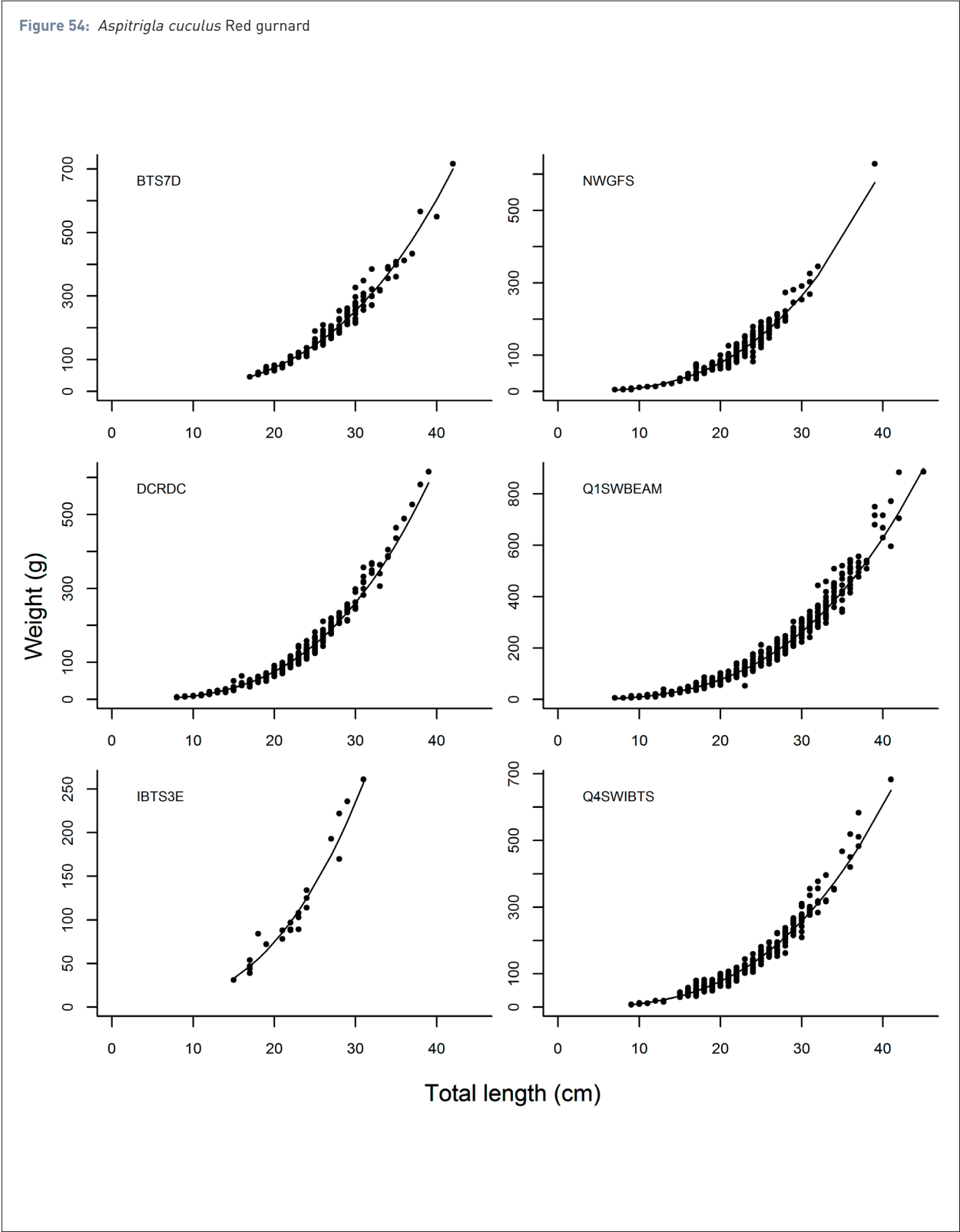


Figure 55: *Trigla lucerna* Tub gurnard

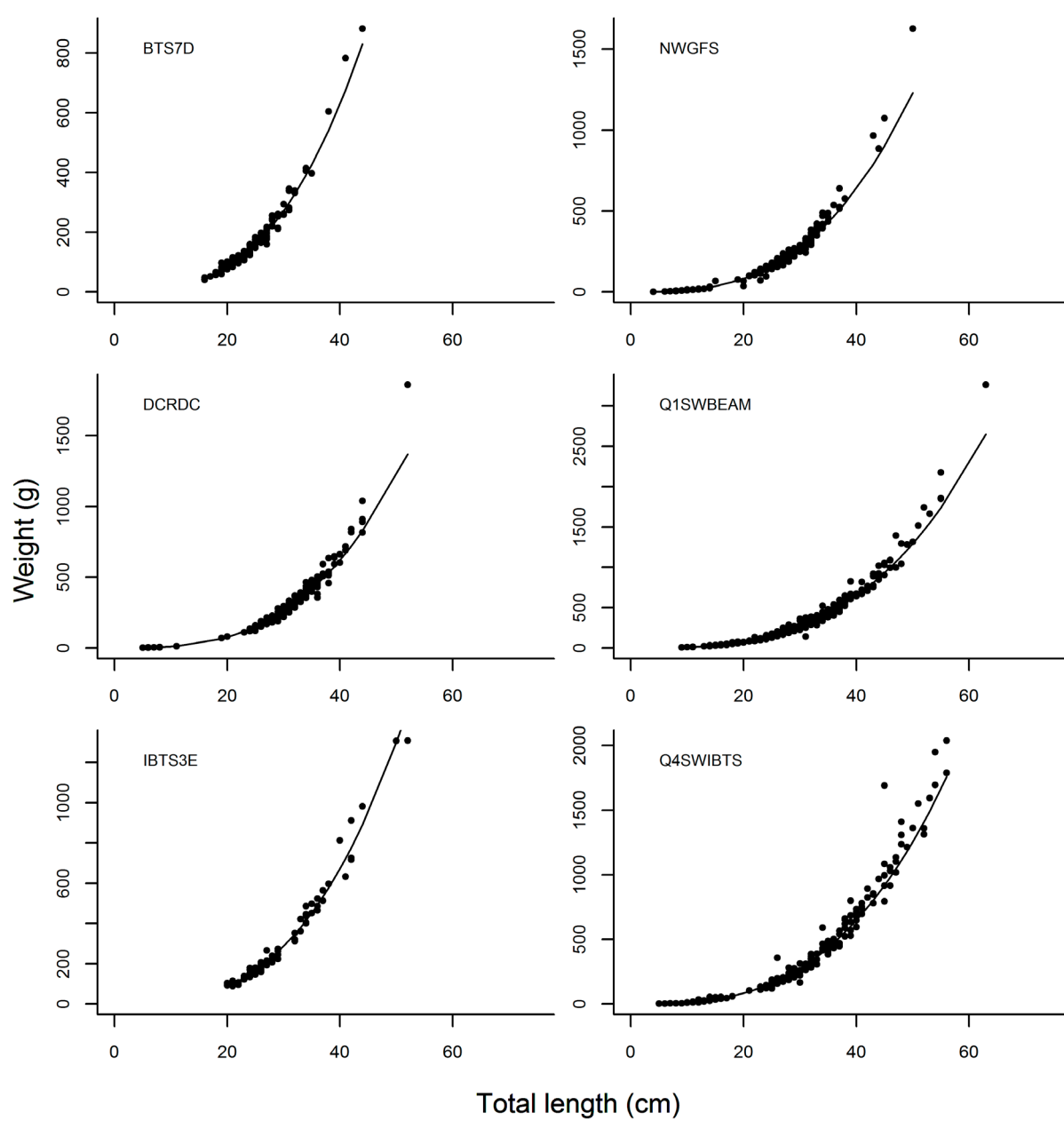


Figure 56: *Eutrigla gurnardus* Grey gurnard

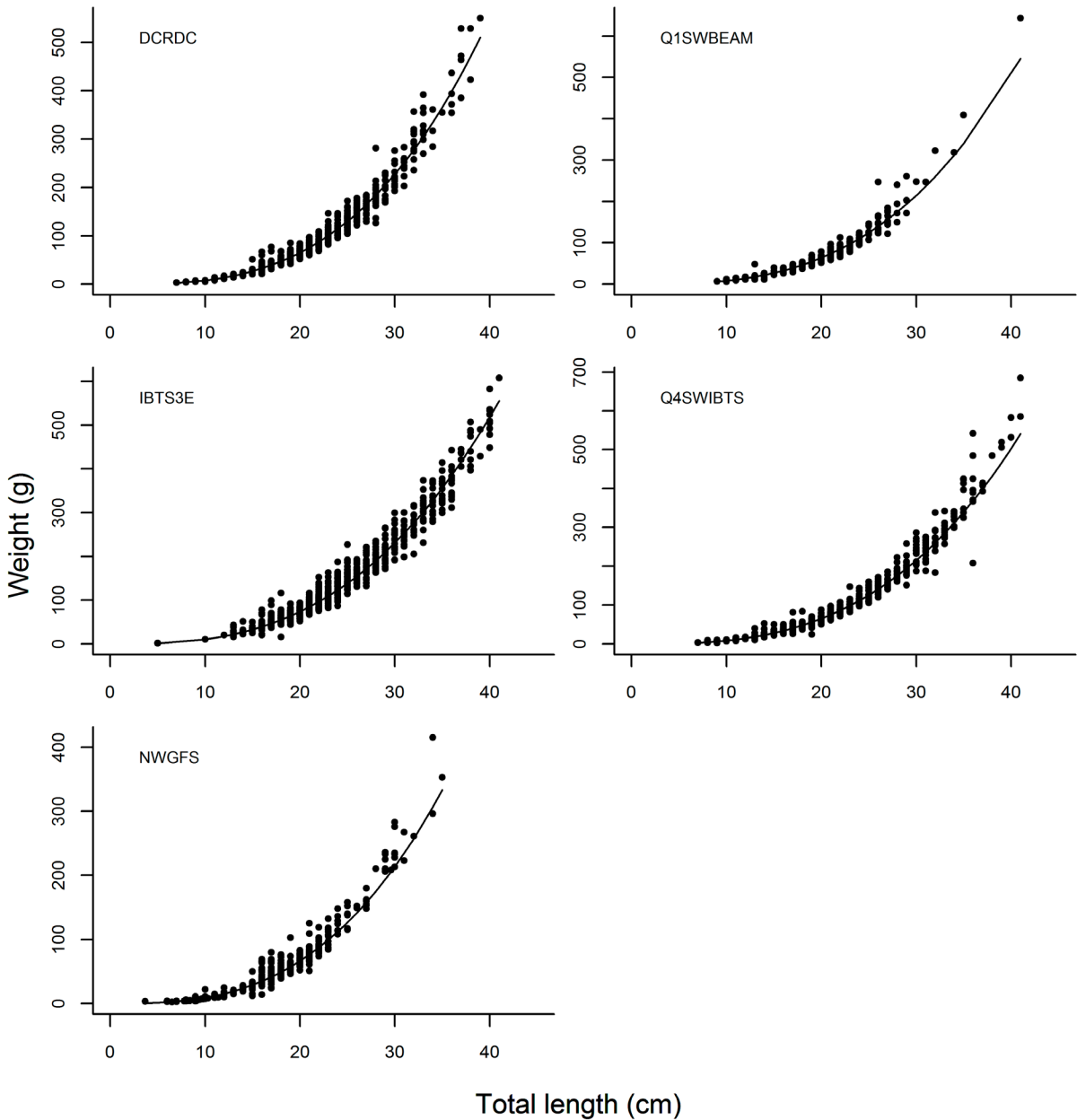


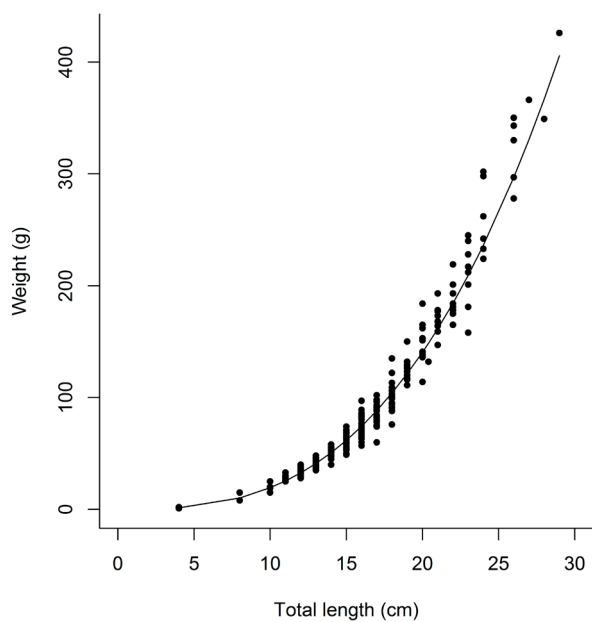
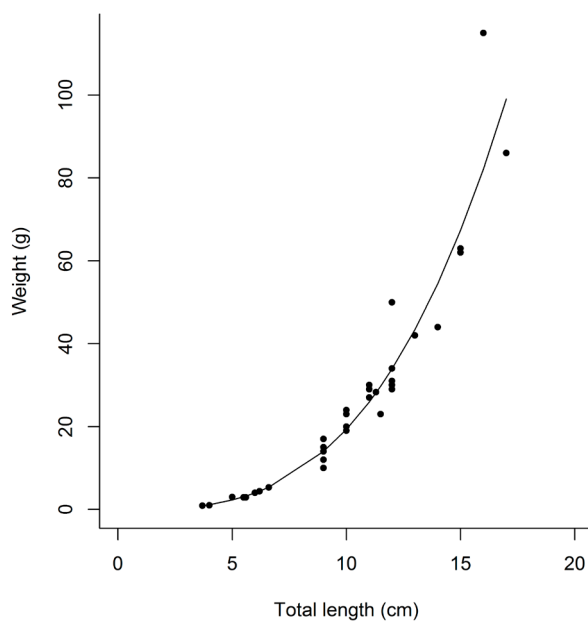
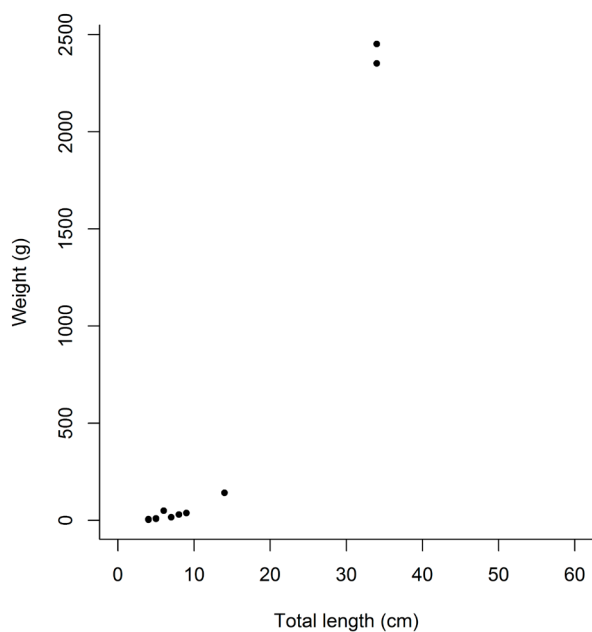
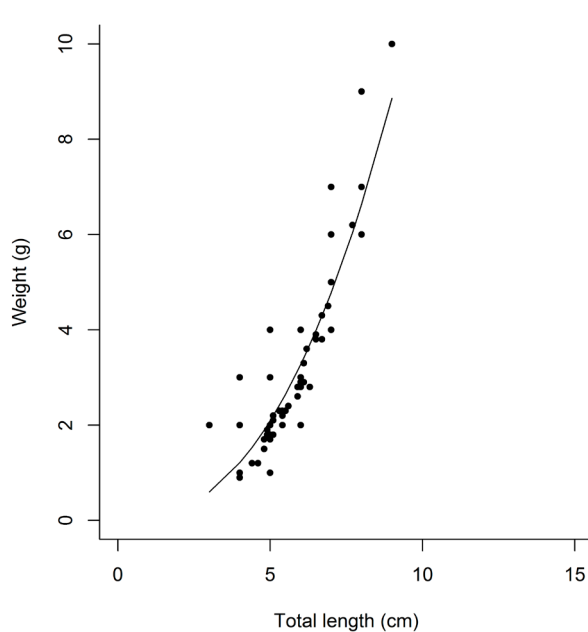
Figure 57: *Myoxocephalus scorpius* Bullrout**Figure 58:** *Taurulus bubalis* Sea scorpion**Figure 59:** *Cyclopterus lumpus* Lumpsucker**Figure 60:** *Liparis* spp. Sea snail

Figure 61: *Agonus cataphractus* Pogge

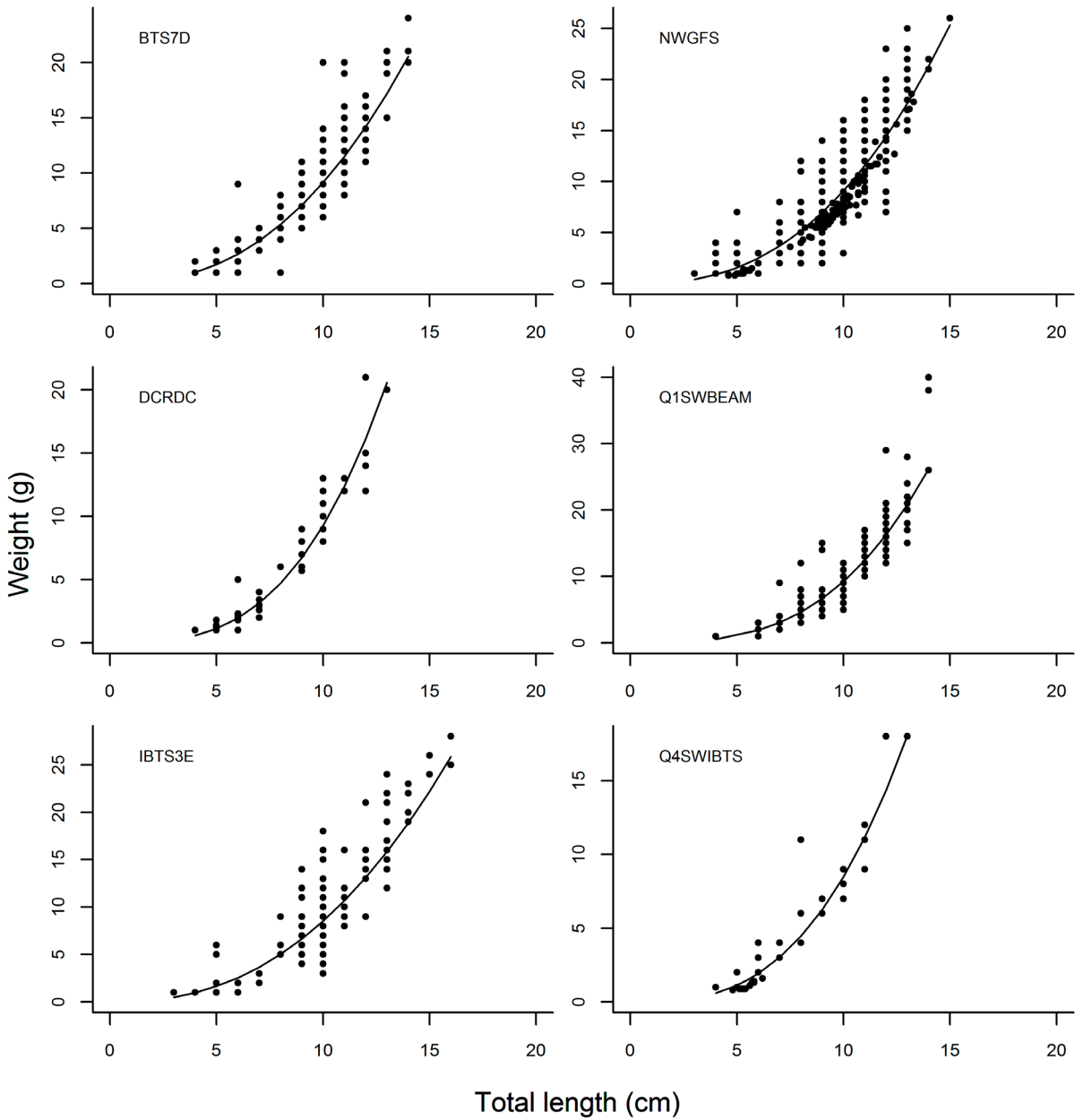


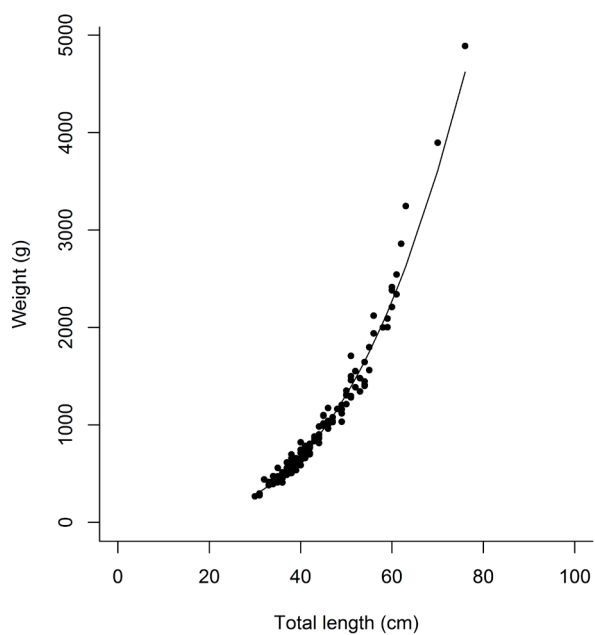
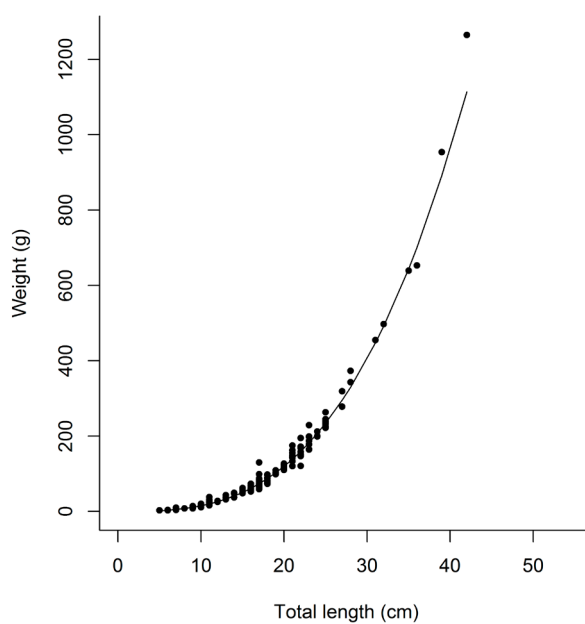
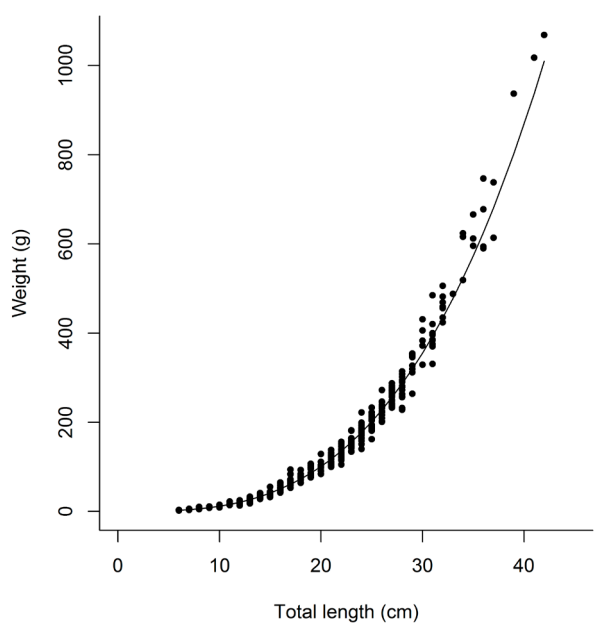
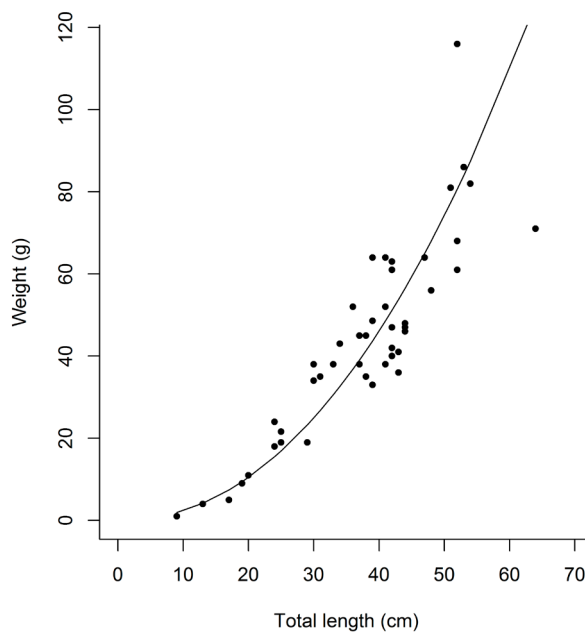
Figure 62: *Dicentrarchus labrax* European seabass**Figure 63:** *Spondyliosoma cantharus* Black sea bream**Figure 64:** *Mullus surmuletus* Red mullet**Figure 65:** *Cepola rubescens* Red bandfish

Figure 66: *Trachurus trachurus* Horse mackerel

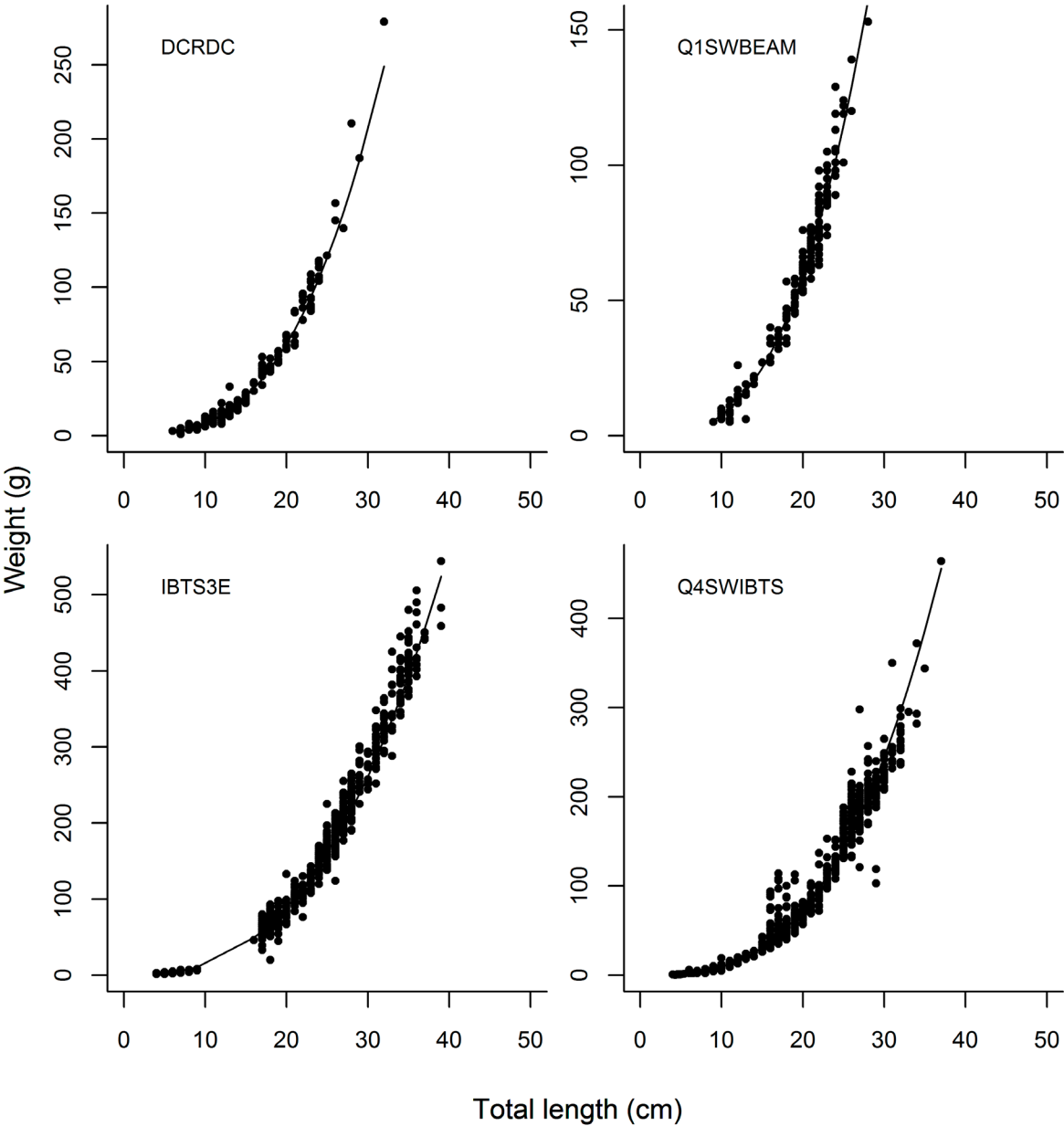


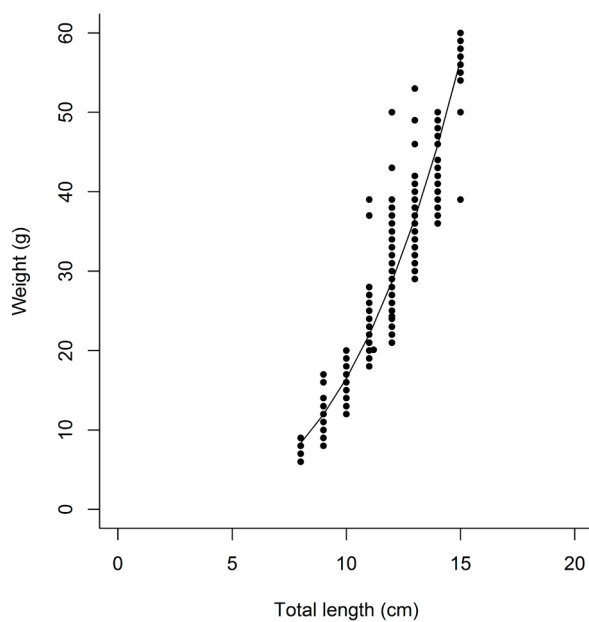
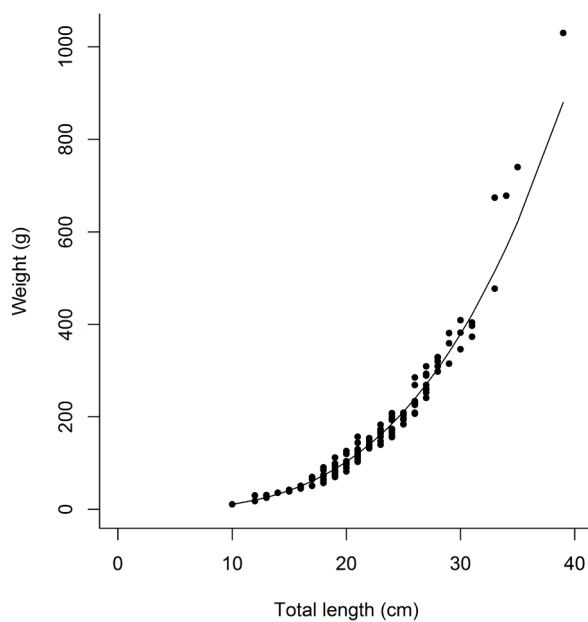
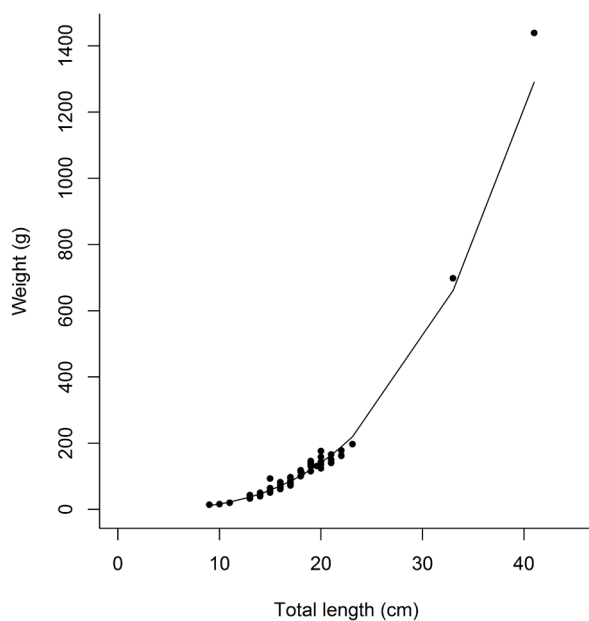
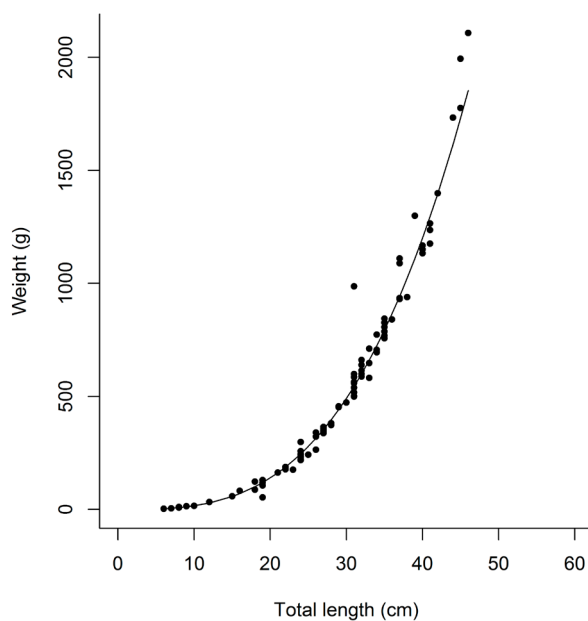
Figure 67: *Ctenolabrus rupestris* Goldsinny**Figure 68:** *Labrus mixtus* Cuckoo wrasse**Figure 69:** *Symphodus balloni* Baillon's wrasse**Figure 70:** *Labrus bergylta* Ballan wrasse

Figure 71: *Ammodytes* spp. Sandeel

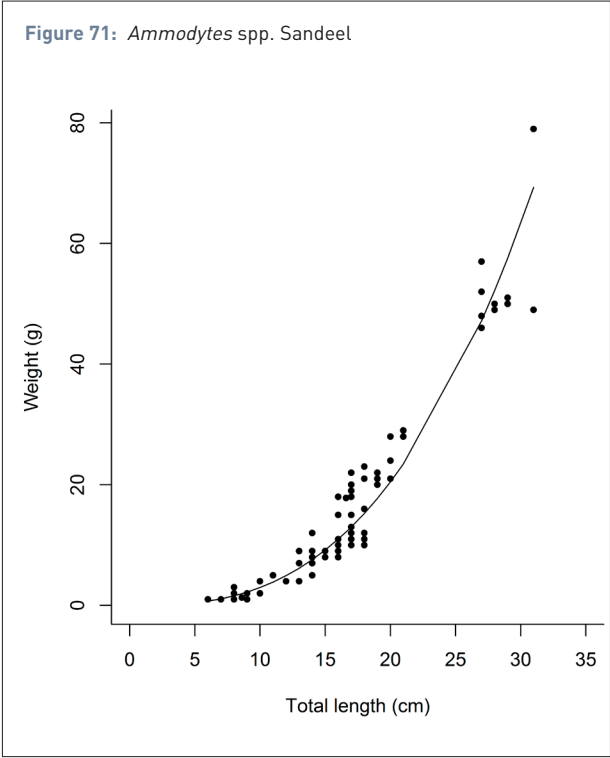


Figure 72: *Gymnammodytes semisquamatus* Smooth sandeel

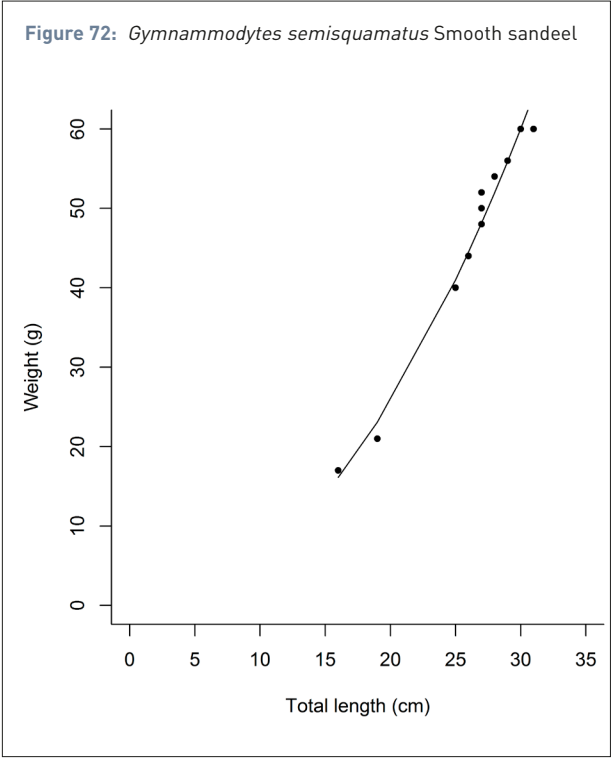


Figure 73: *Hyperoplus lanceolatus* Greater sandeel

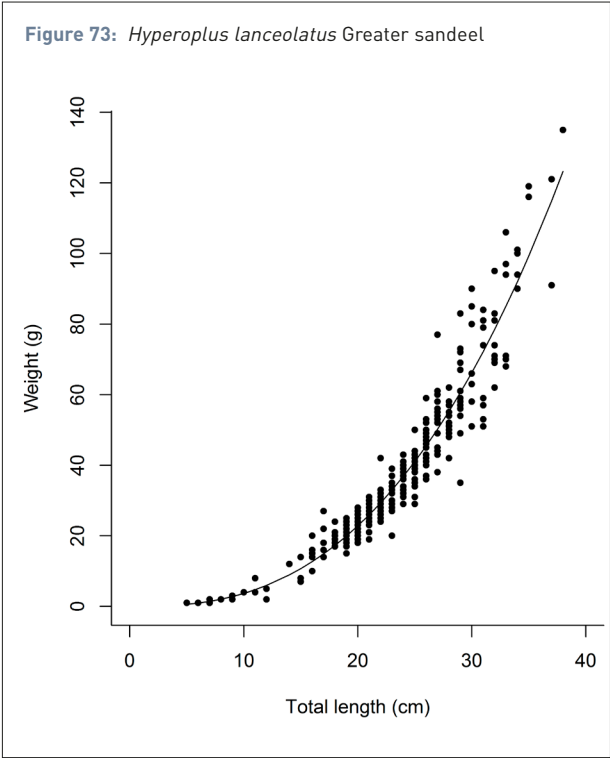


Figure 74: *Hyperoplus immaculatus* Corbin's sandeel

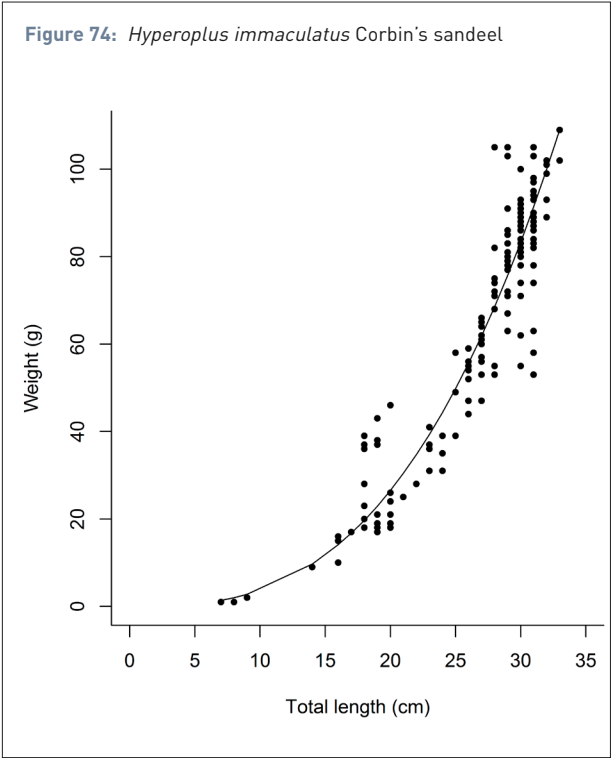


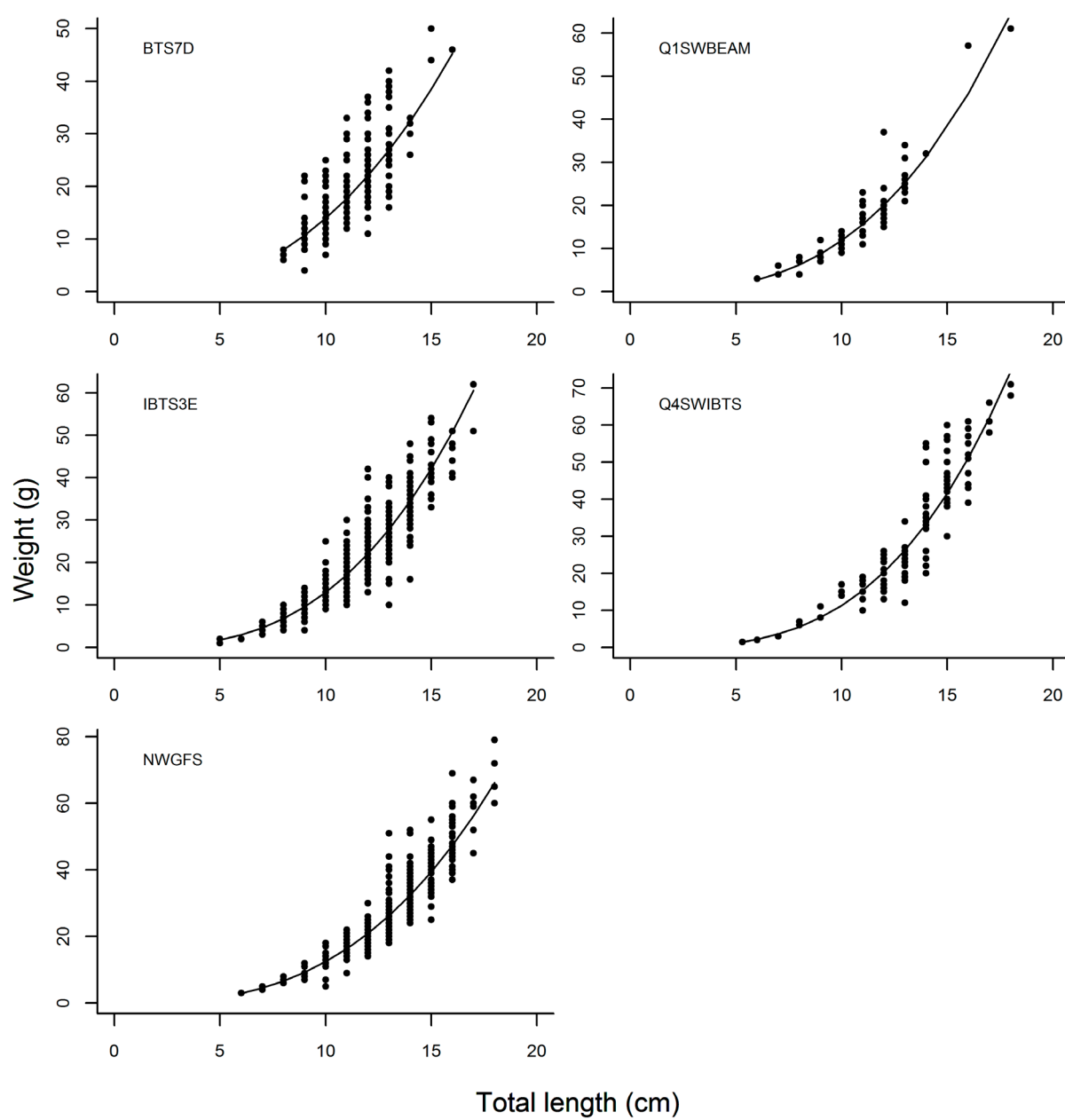
Figure 75: *Echiichthys vipera* Lesser weever

Figure 76: *Trachinus draco* Greater weever

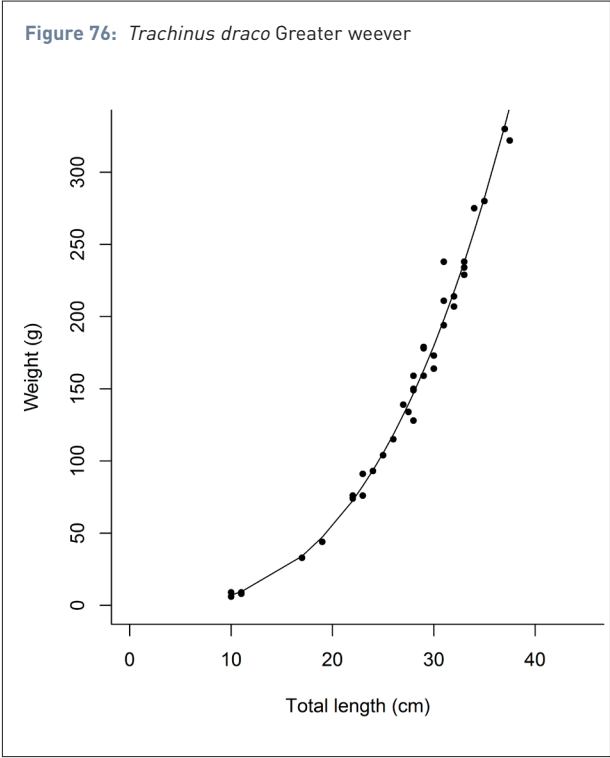


Figure 77: *Blennius ocellaris* Butterfly blenny

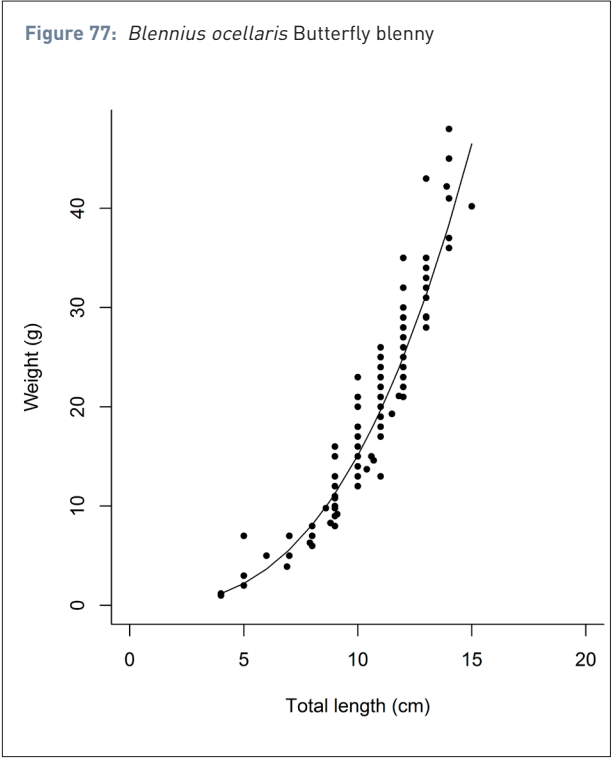


Figure 78: *Parablennius gattorugine* Tompot blenny

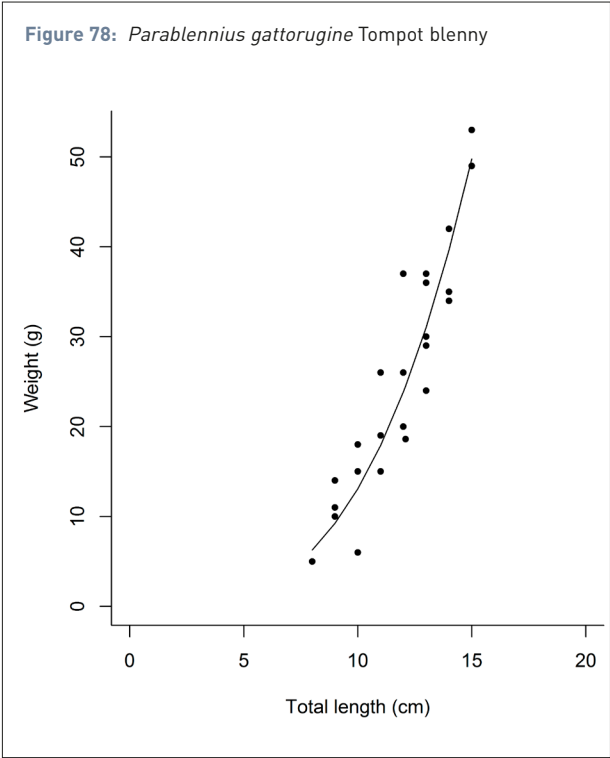


Figure 79: *Lumpenus lampretaeformis* Snake blenny

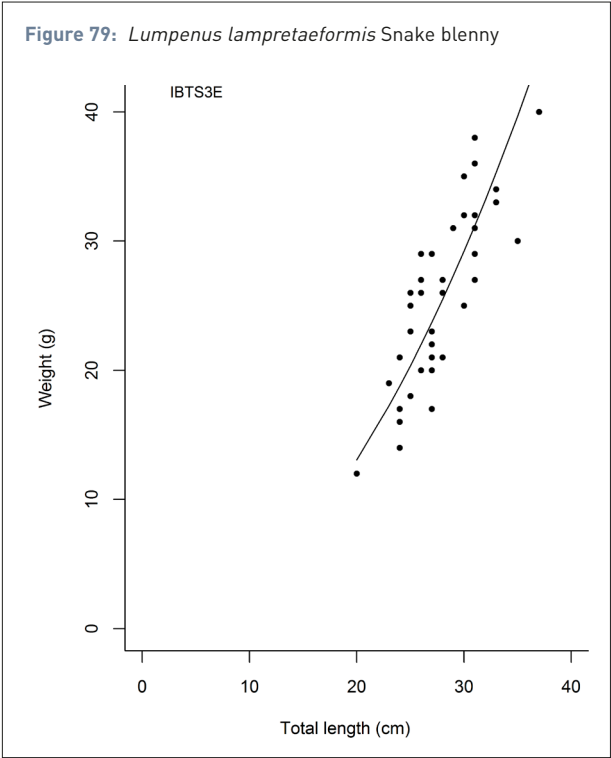


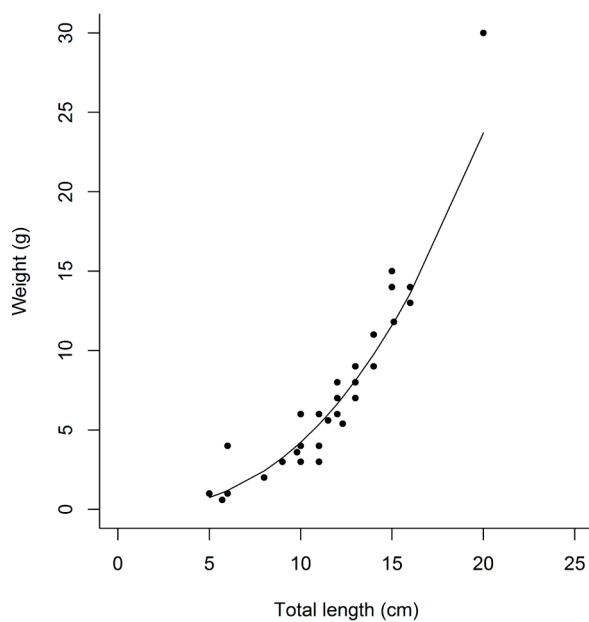
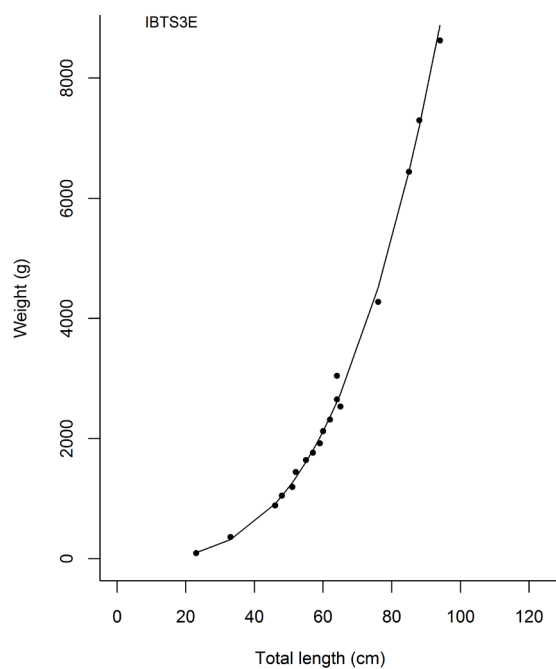
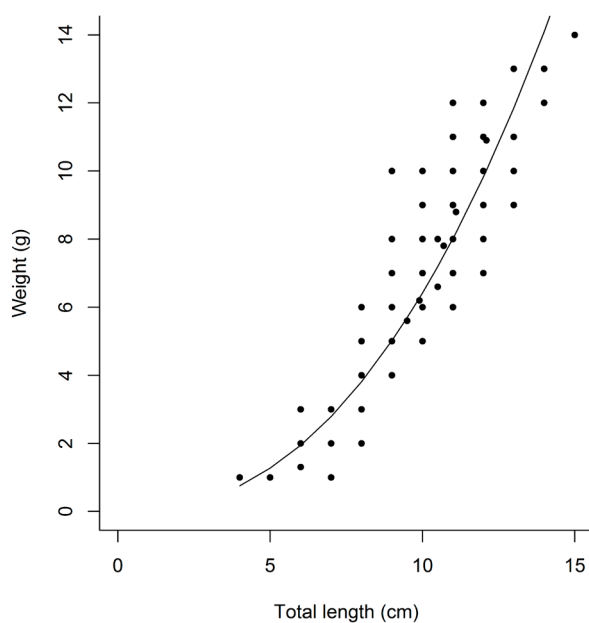
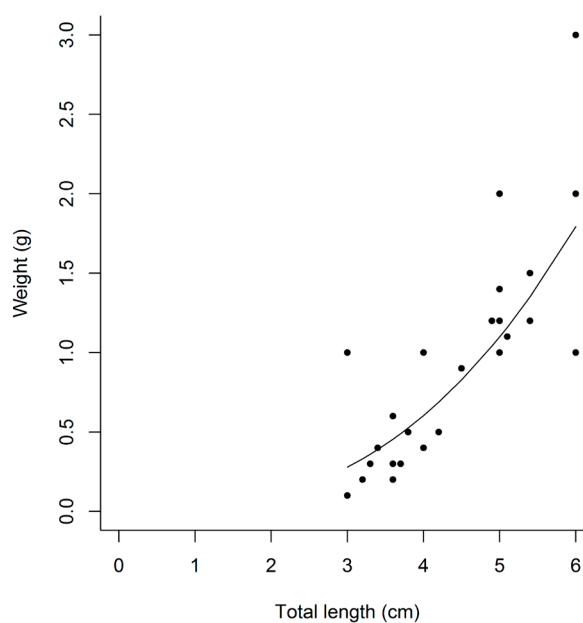
Figure 80: *Pholis gunnellus* Butterfish**Figure 81:** *Anarhichas lupus* Wolf-fish**Figure 82:** *Callionymus reticulatus* Reticulate dragonet**Figure 83:** *Buenia jeffreysii* Jeffrey's goby

Figure 84: *Callionymus lyra* Common dragonet

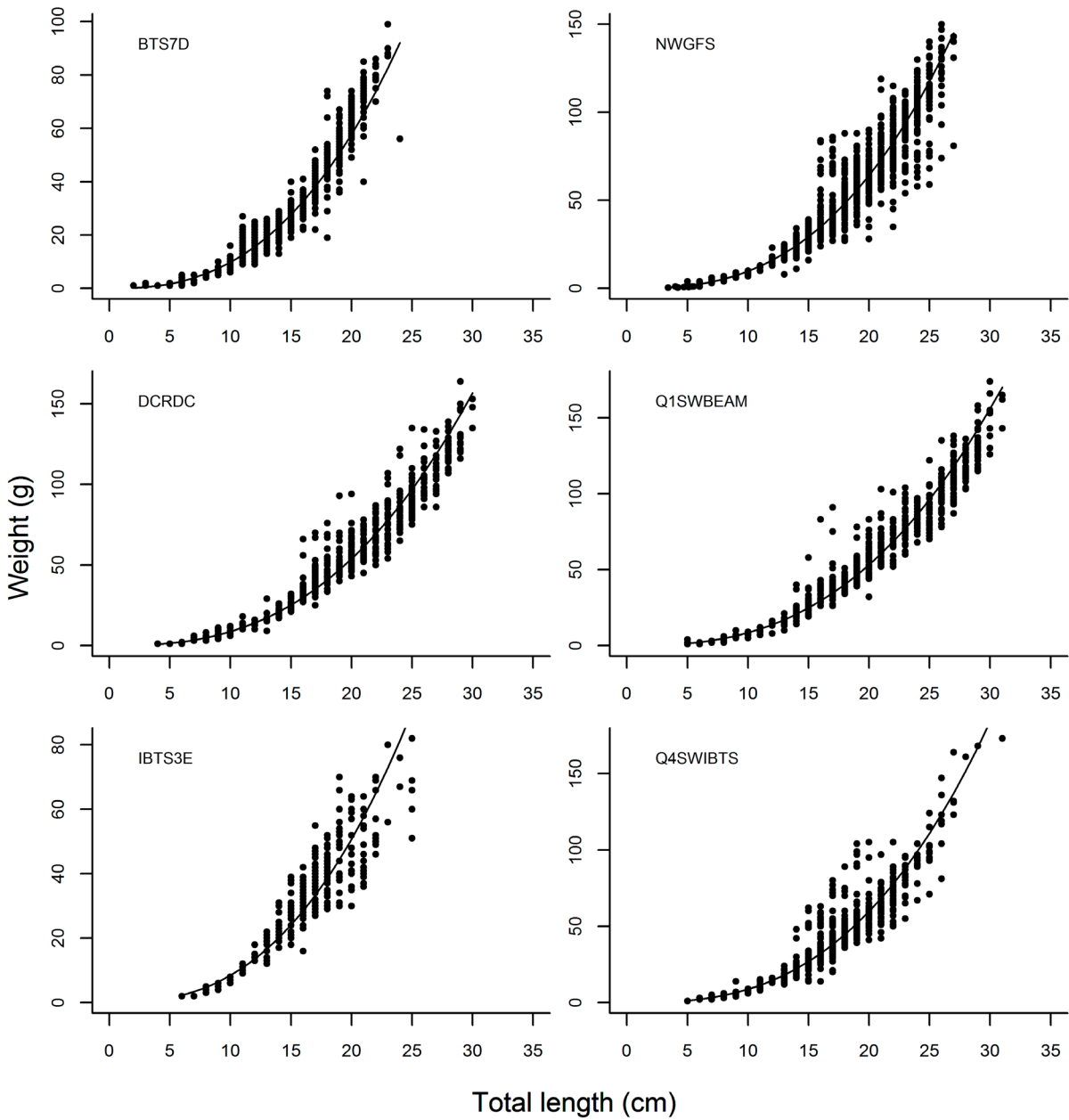


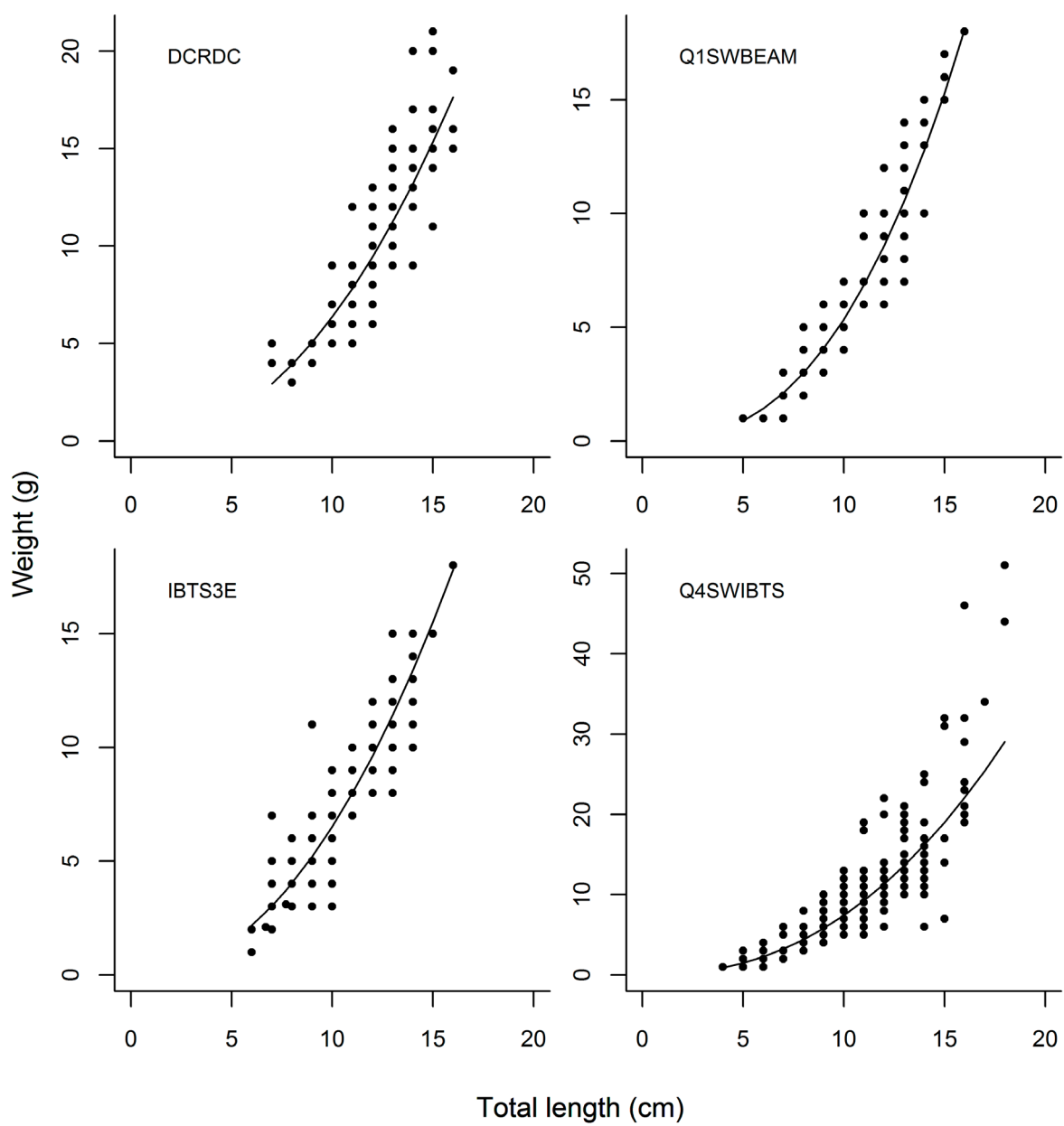
Figure 85: *Callionymus maculatus* Spotted dragonet

Figure 86: *Gobius gasteveni* Steven's goby

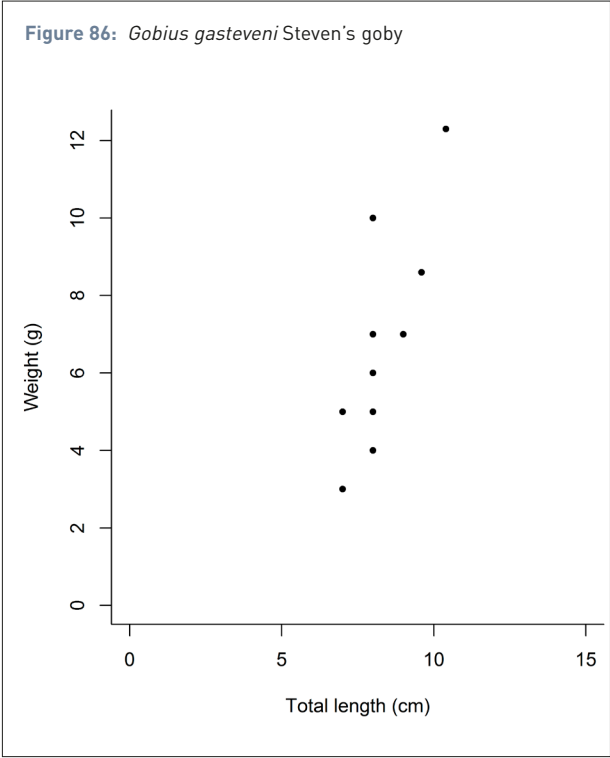


Figure 87: *Gobius niger* Black goby

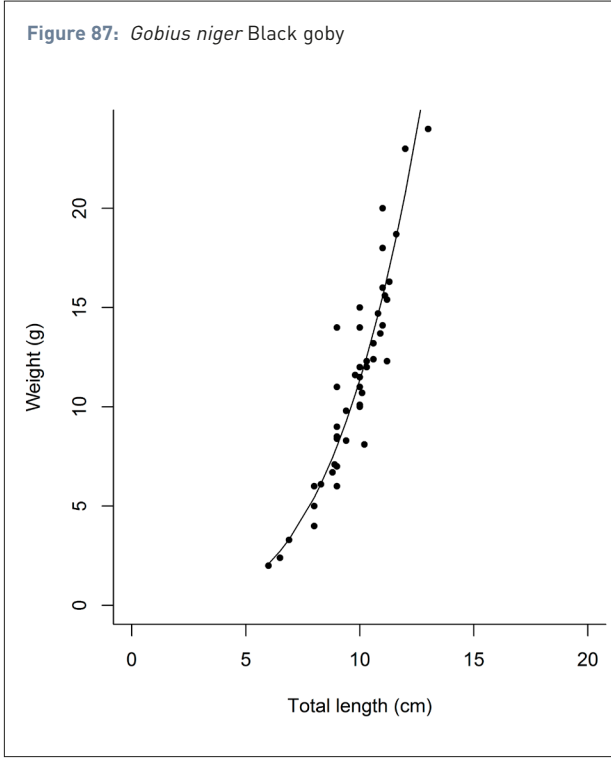


Figure 88: *Gobius paganellus* Rock goby

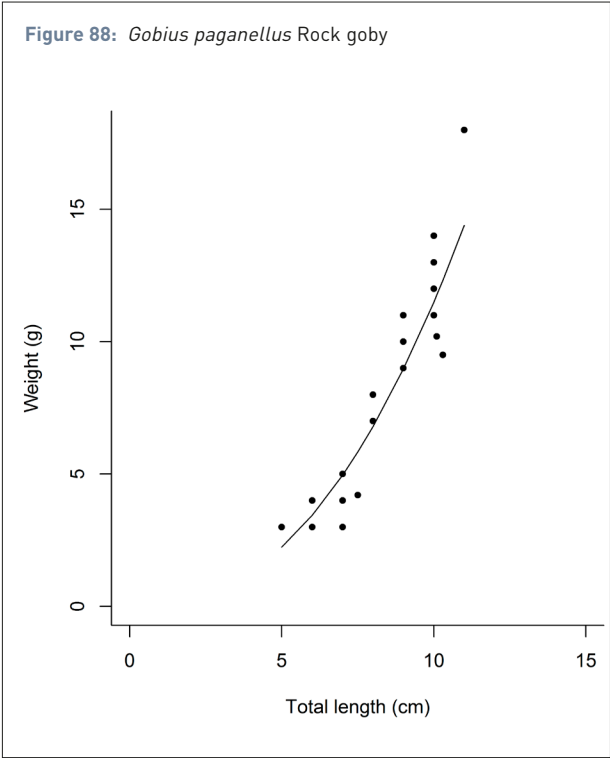


Figure 89: *Lesueurigobius friesii* Fries's goby

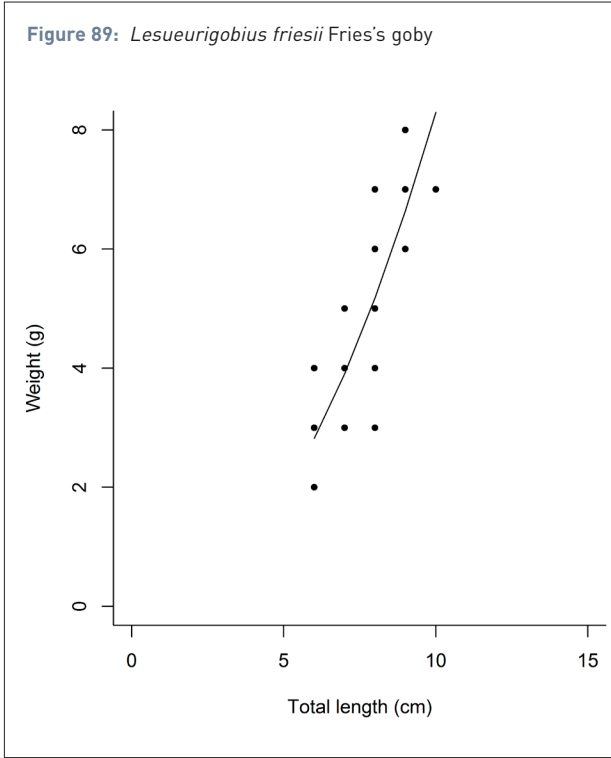


Figure 90: *Scomber scombrus* European mackerel

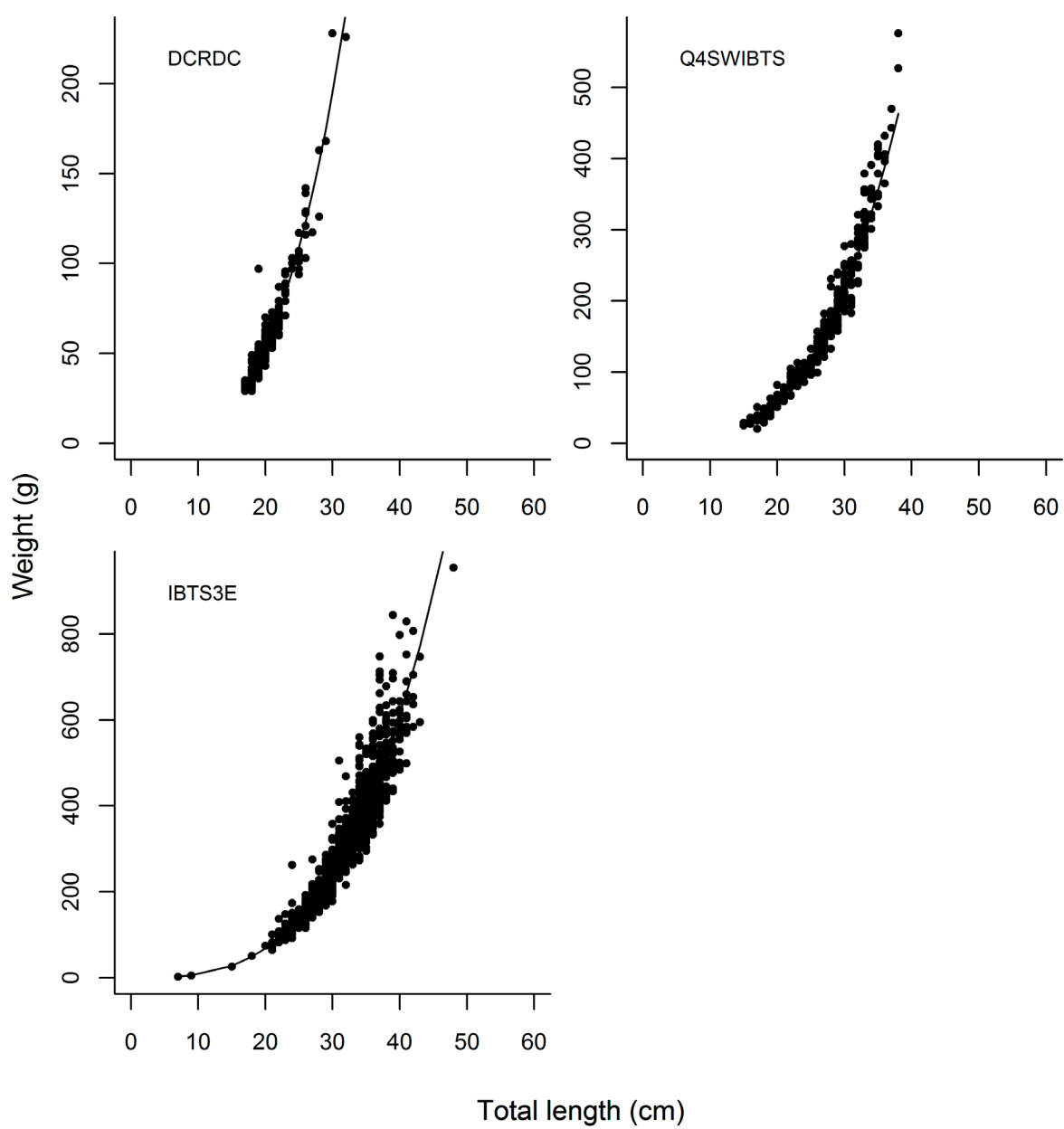


Figure 91: *Lepidorhombus whiffiagonis* Megrim

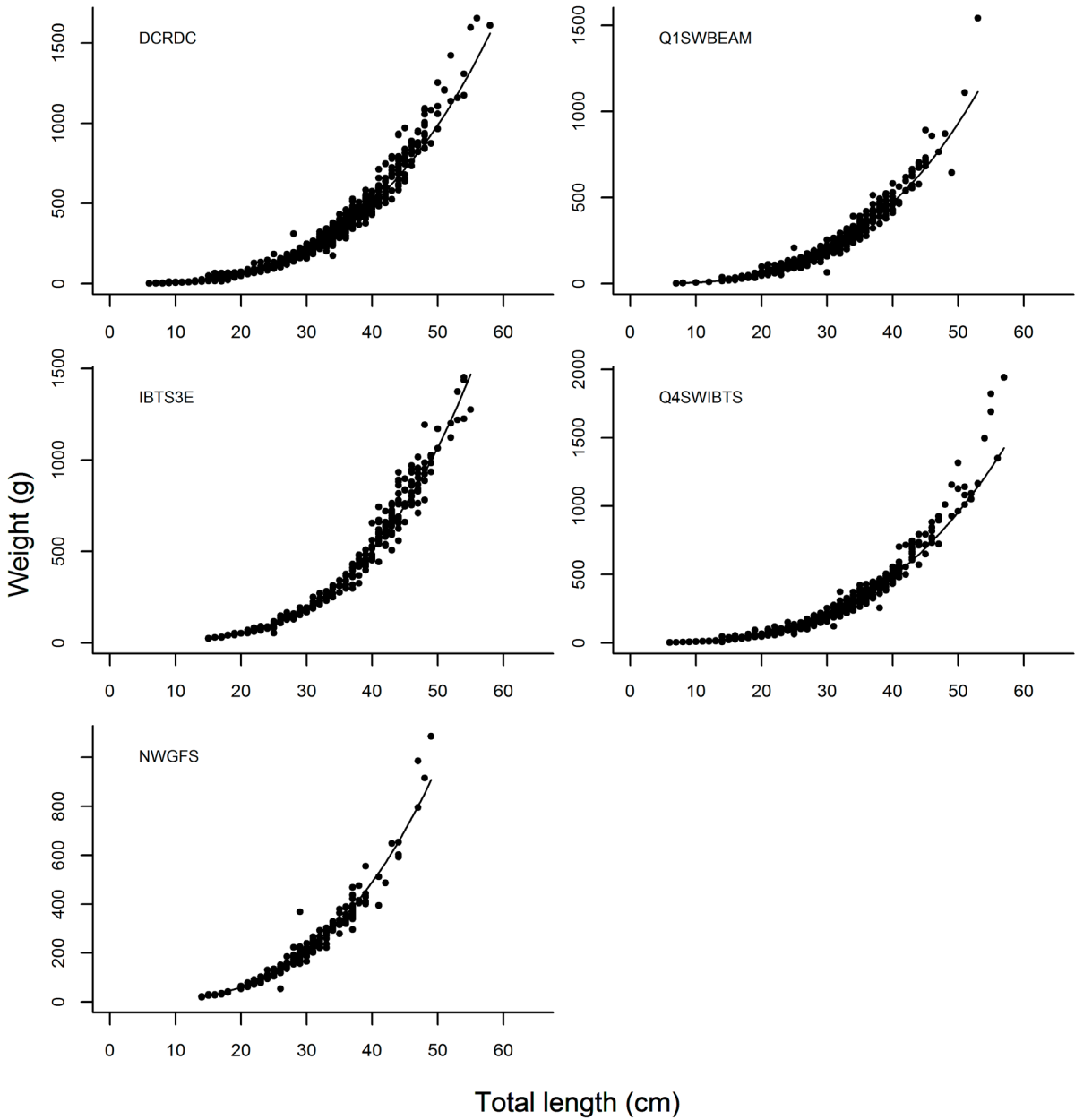


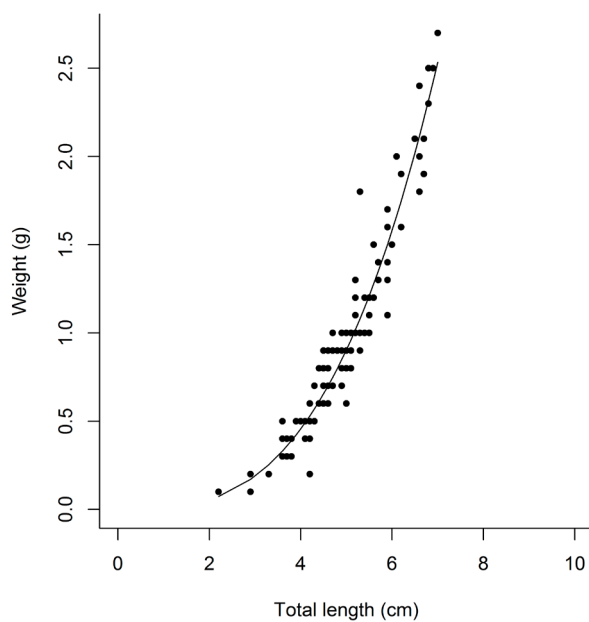
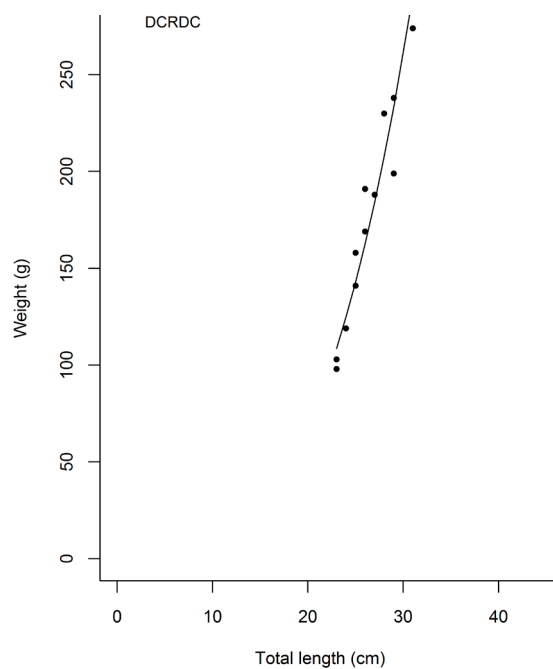
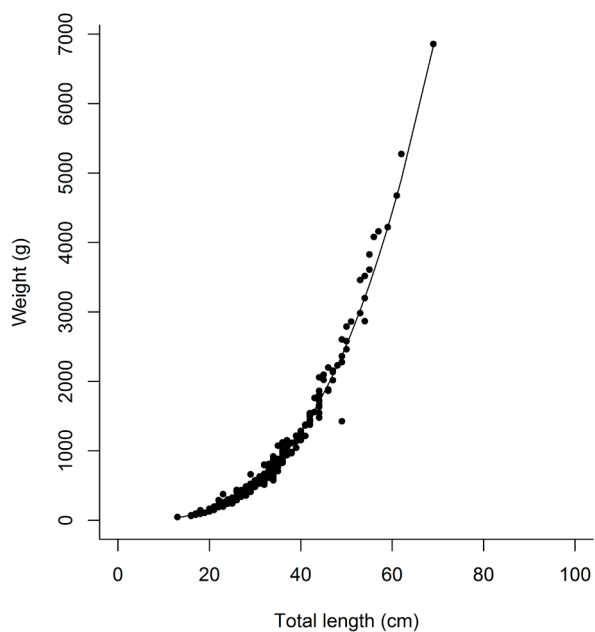
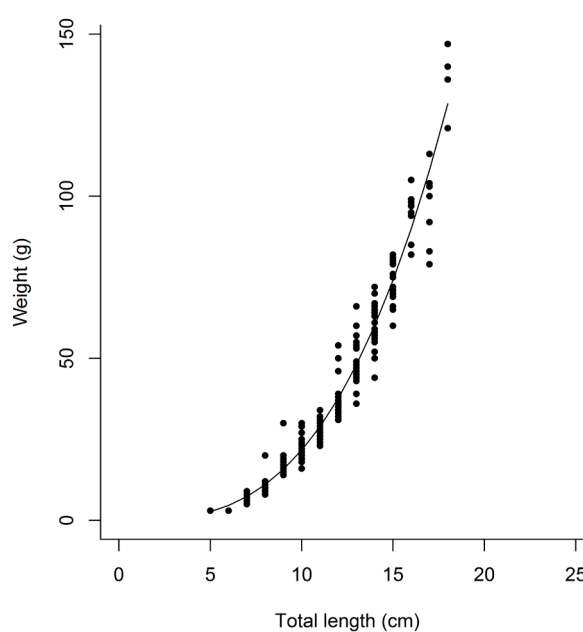
Figure 92: *Pomatoschistus* spp. Sand goby**Figure 93:** *Lepidorhombus boscii* Four-spot megrim**Figure 94:** *Scophthalmus maximus* Turbot**Figure 95:** *Zeugopterus punctatus* Topknot

Figure 96: *Scophthalmus rhombus* Brill

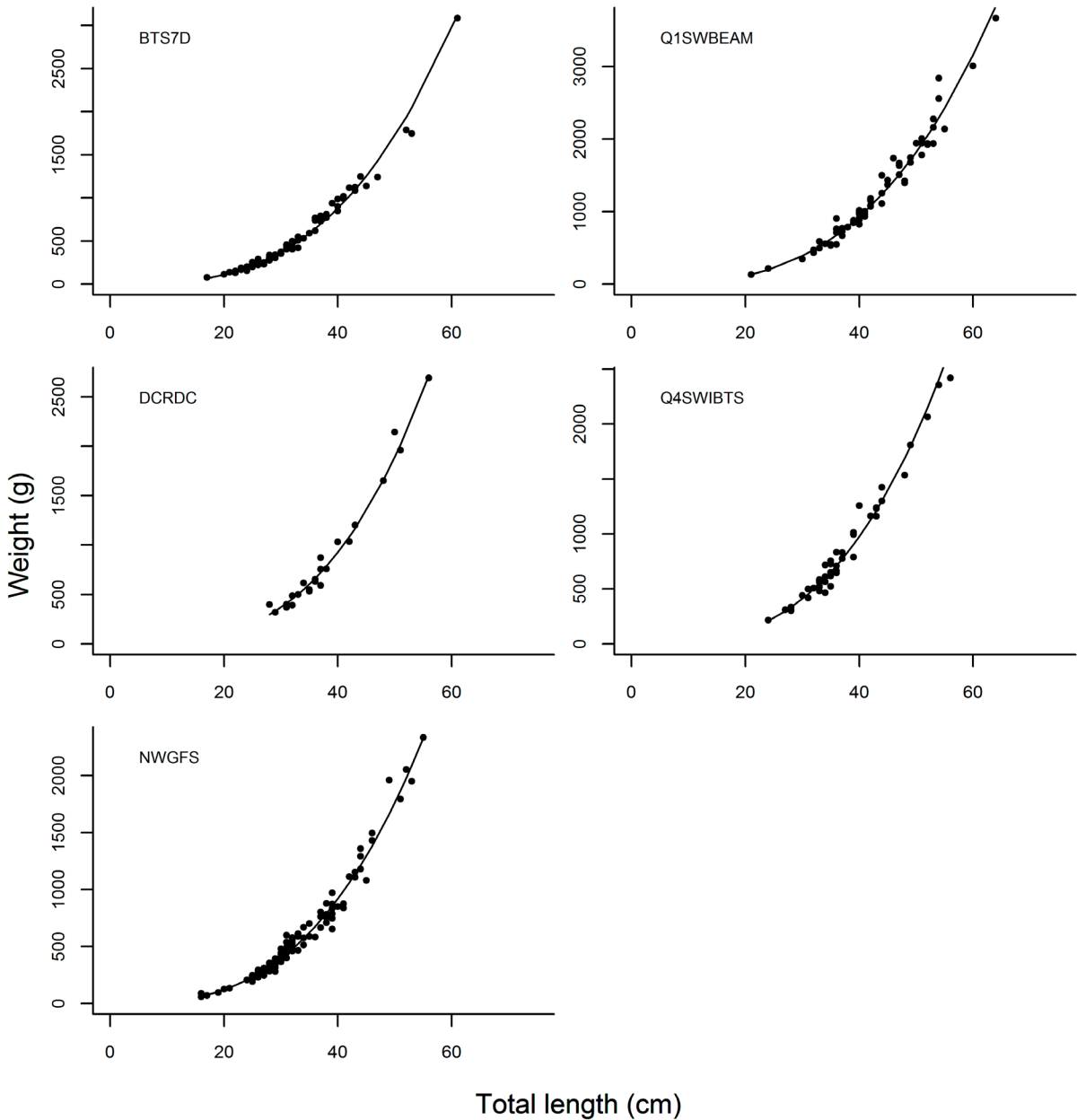


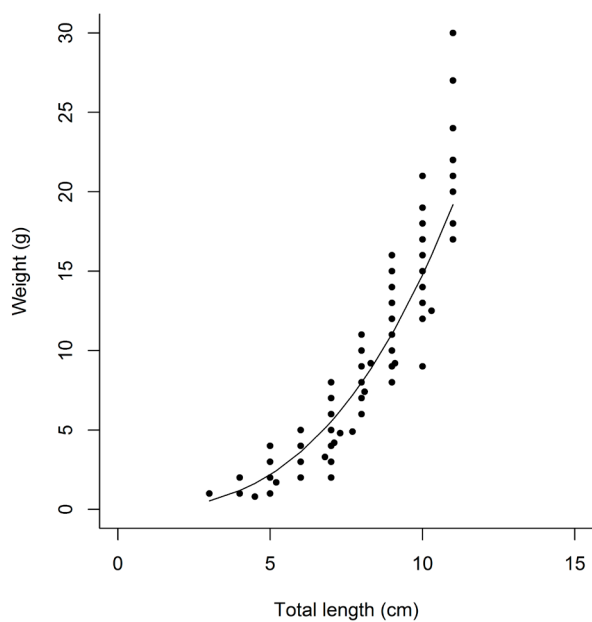
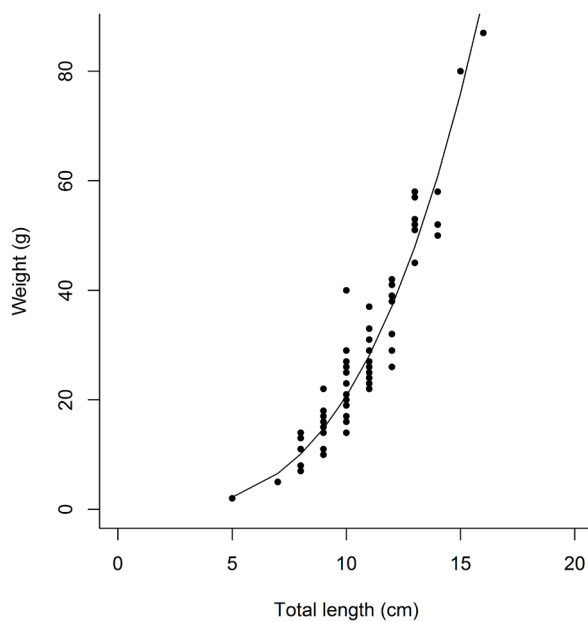
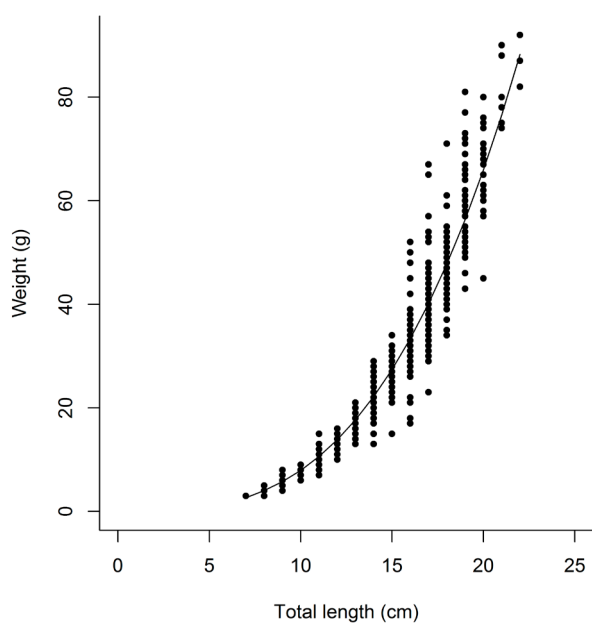
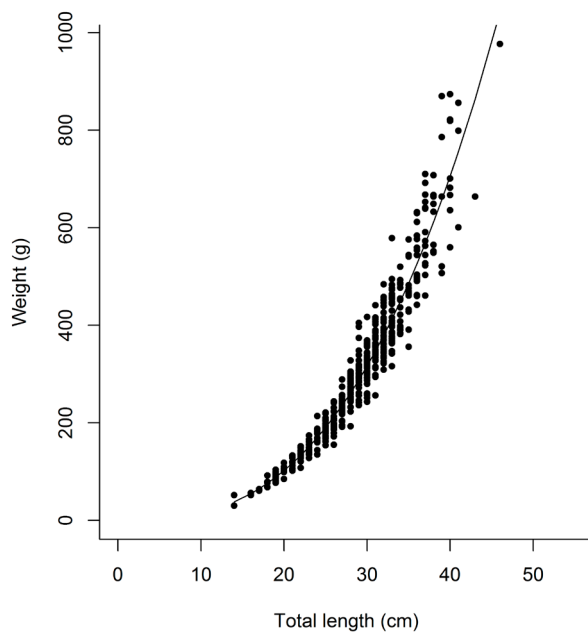
Figure 97: *Phrynorhombus norvegicus* Norwegian topknot**Figure 98:** *Phrynorhombus regius* Ekström's topknot**Figure 99:** *Arnoglossus imperialis* Imperial scaldfish**Figure 100:** *Platichthys flesus* Flounder

Figure 101: *Arnoglossus laterna* Scaldfish

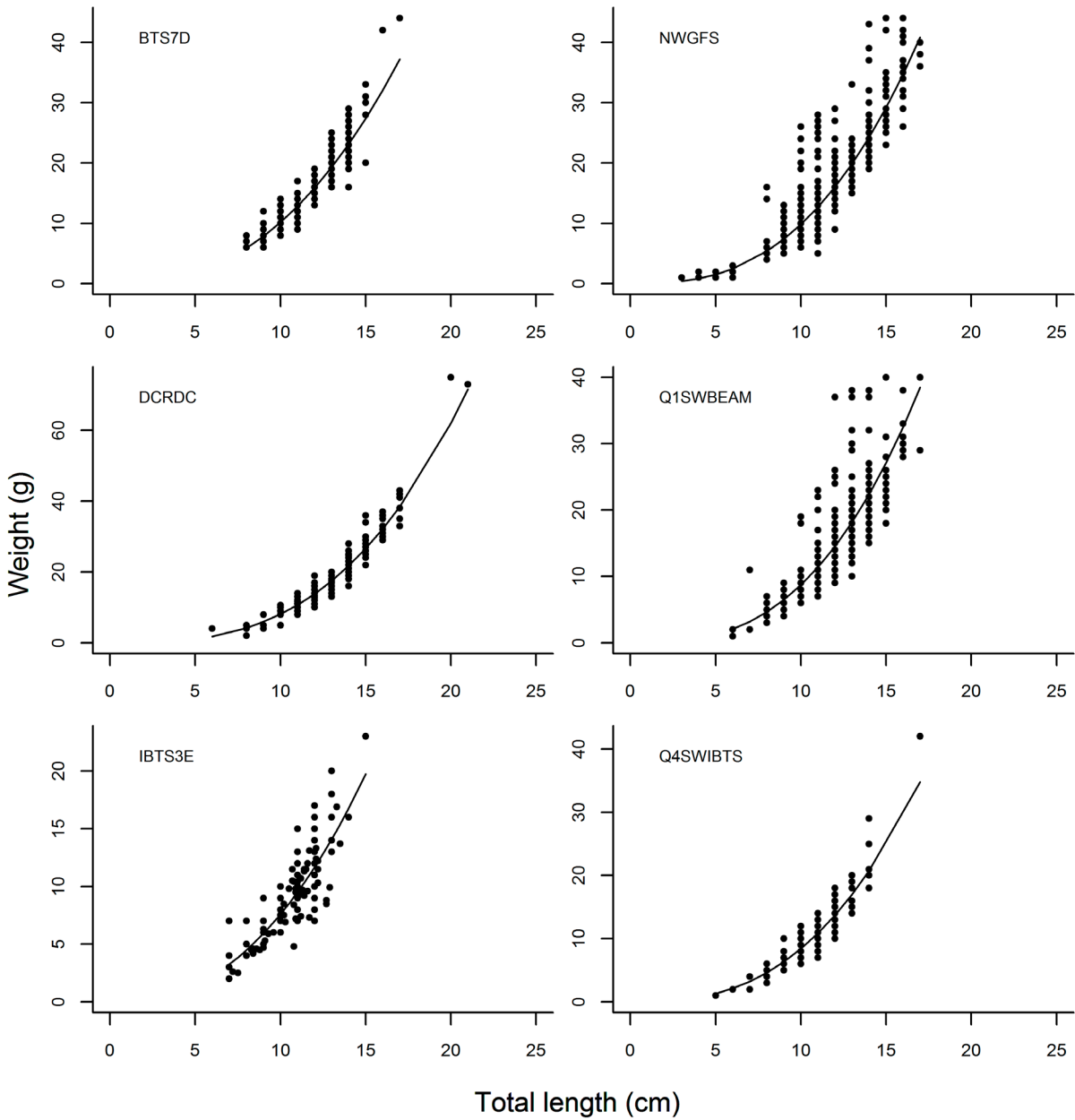


Figure 102: *Pleuronectes platessa* European plaice

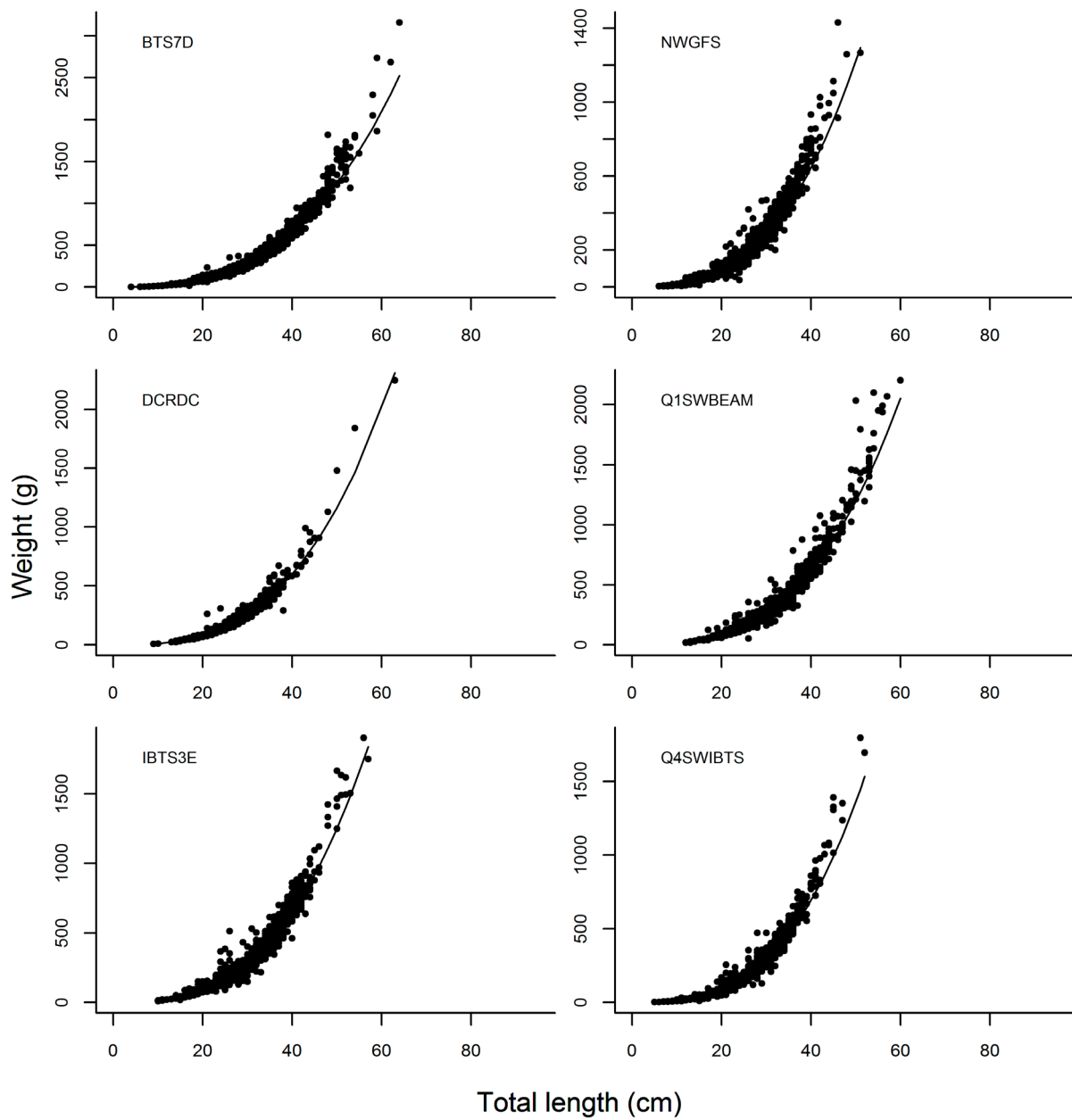


Figure 103: *Limanda limanda* Dab

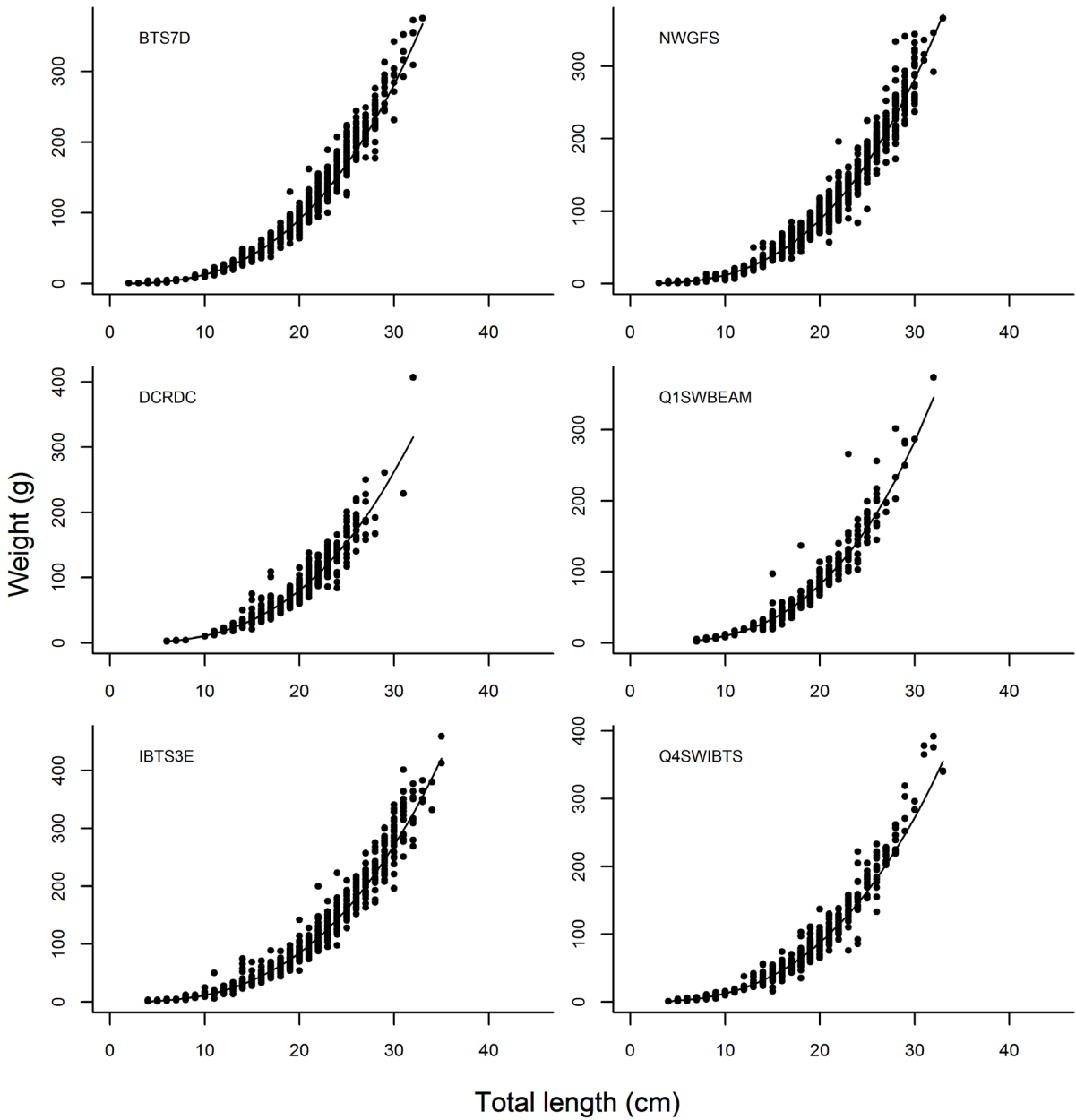


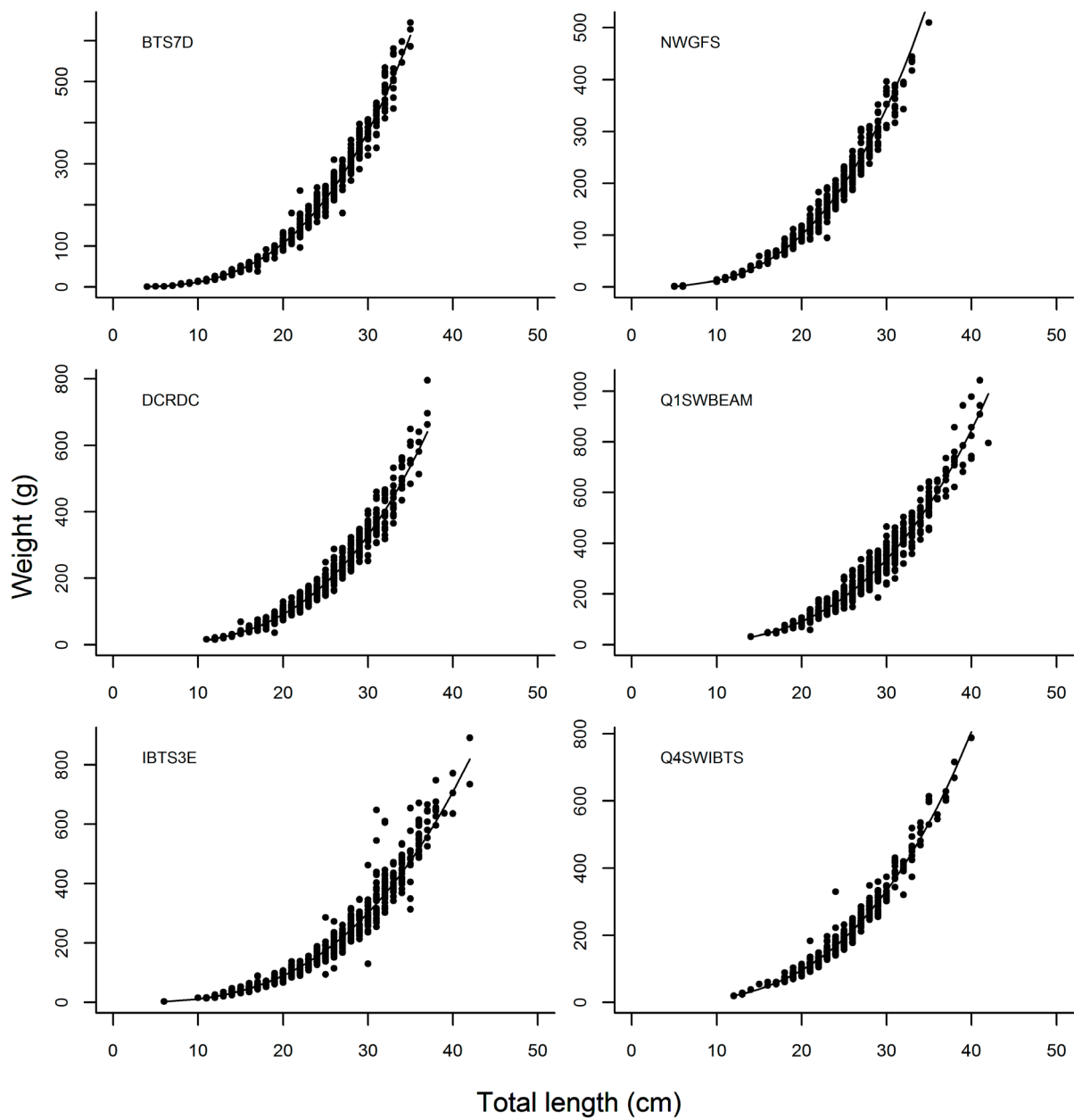
Figure 104: *Microstomus kitt* Lemon sole

Figure 105: *Glyptocephalus cynoglossus* Witch

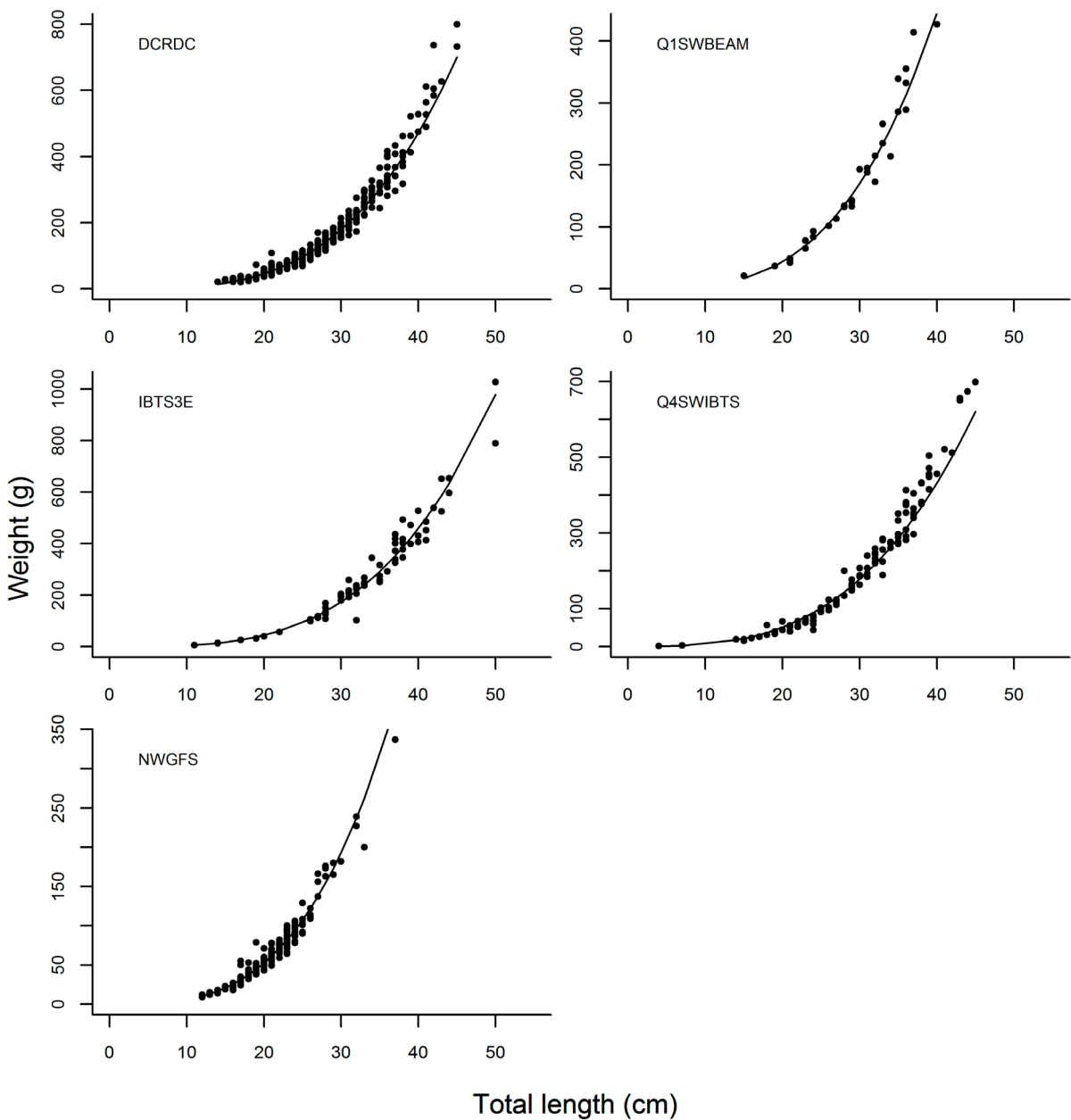


Figure 106: *Hippoglossoides platessoides* Long-rough dab

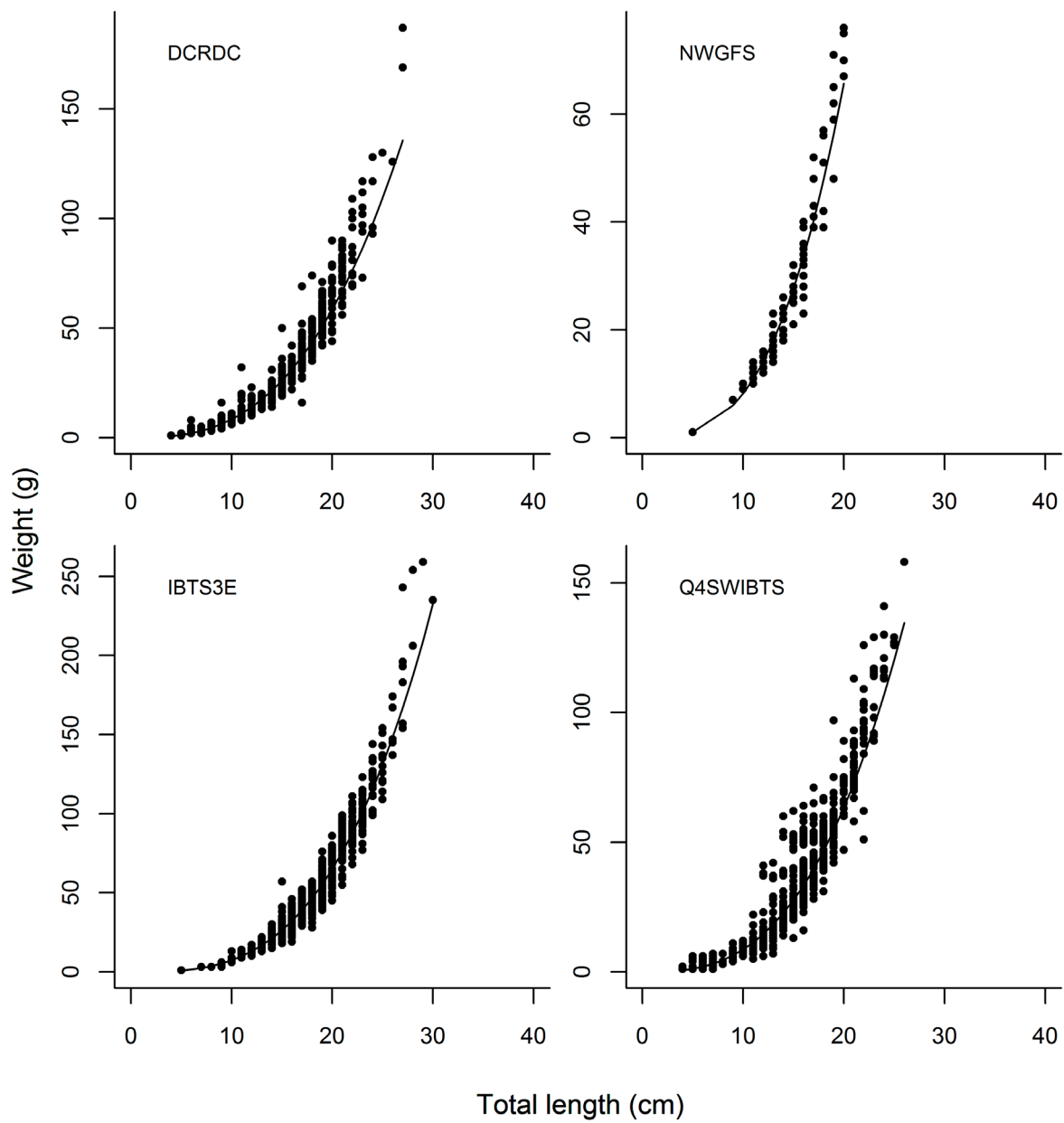


Figure 107: *Hippoglossus hippoglossus* Halibut

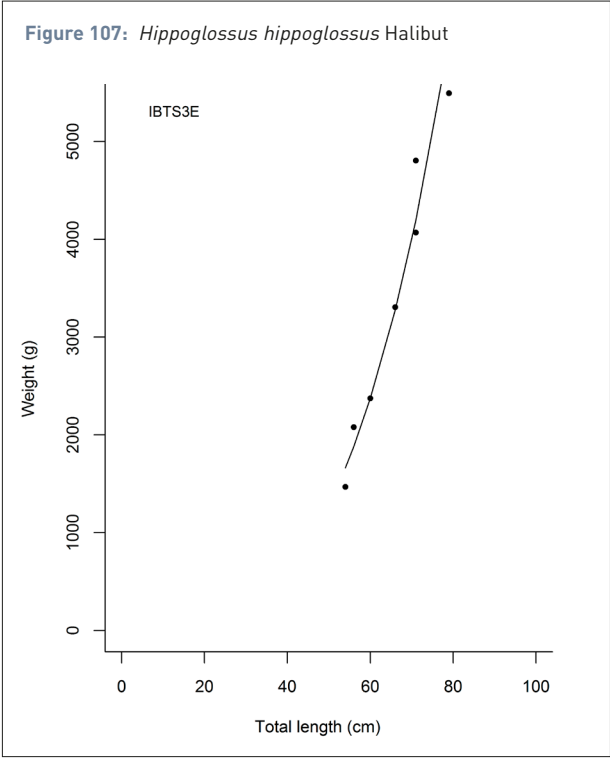


Figure 108: *Pegusa lascaris* Sand sole

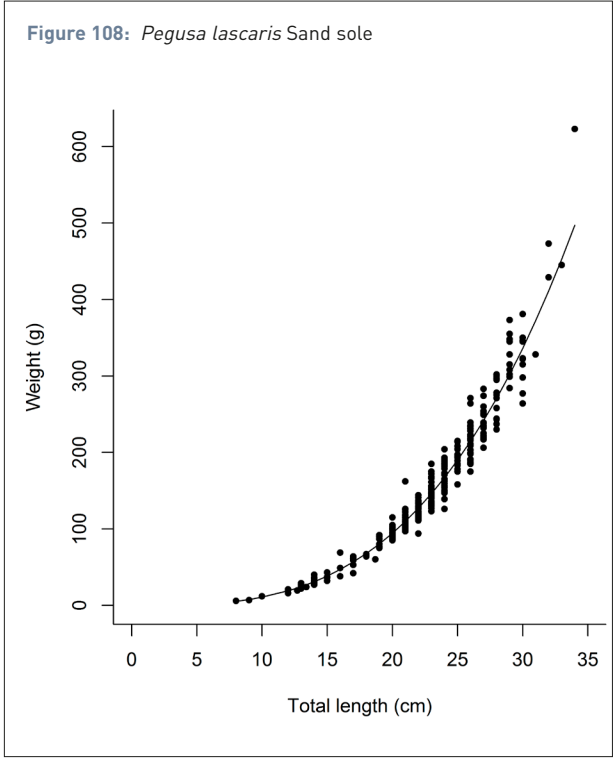


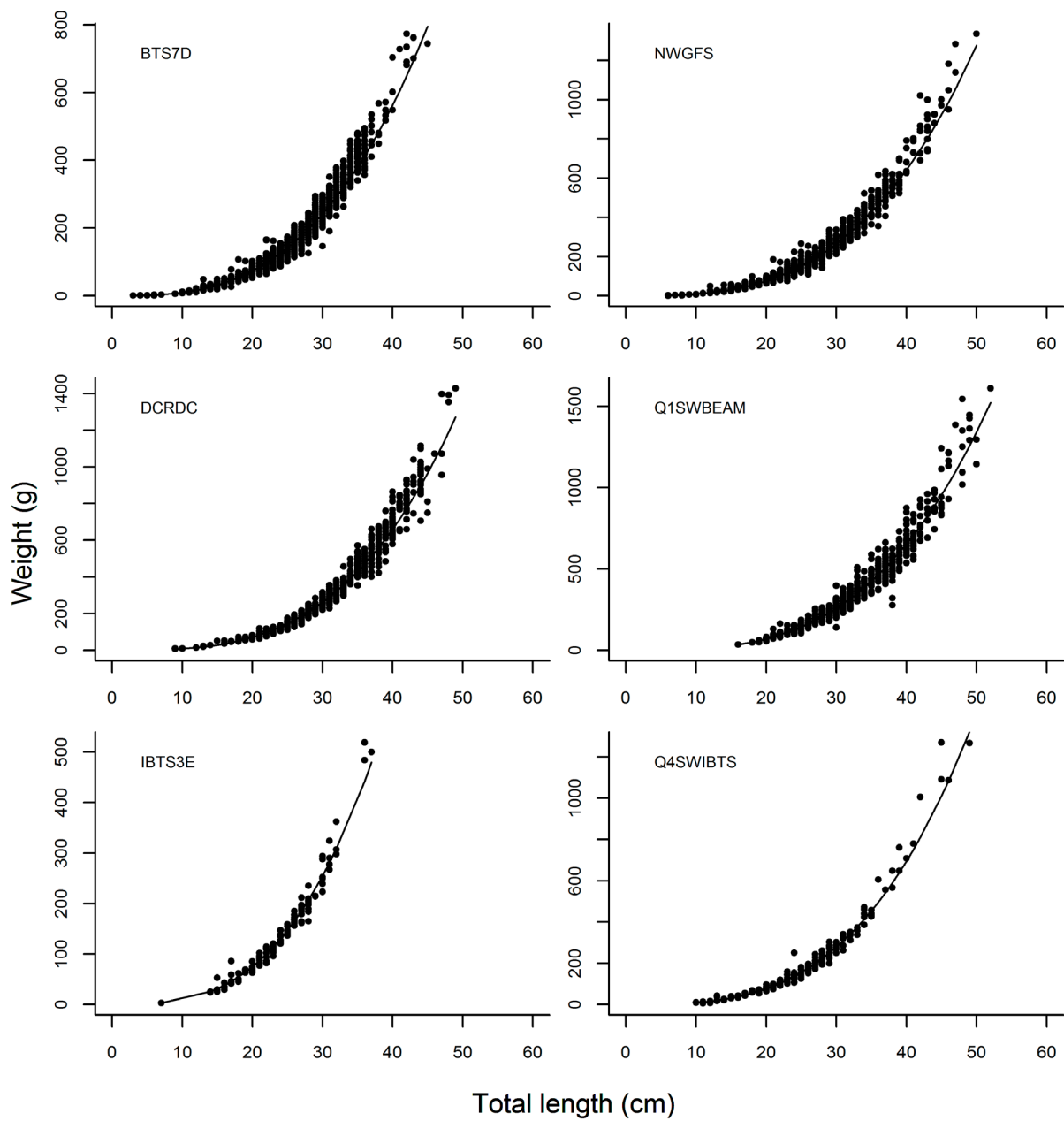
Figure 109: *Solea solea* Sole

Figure 110: *Buglossidium luteum* Solenette

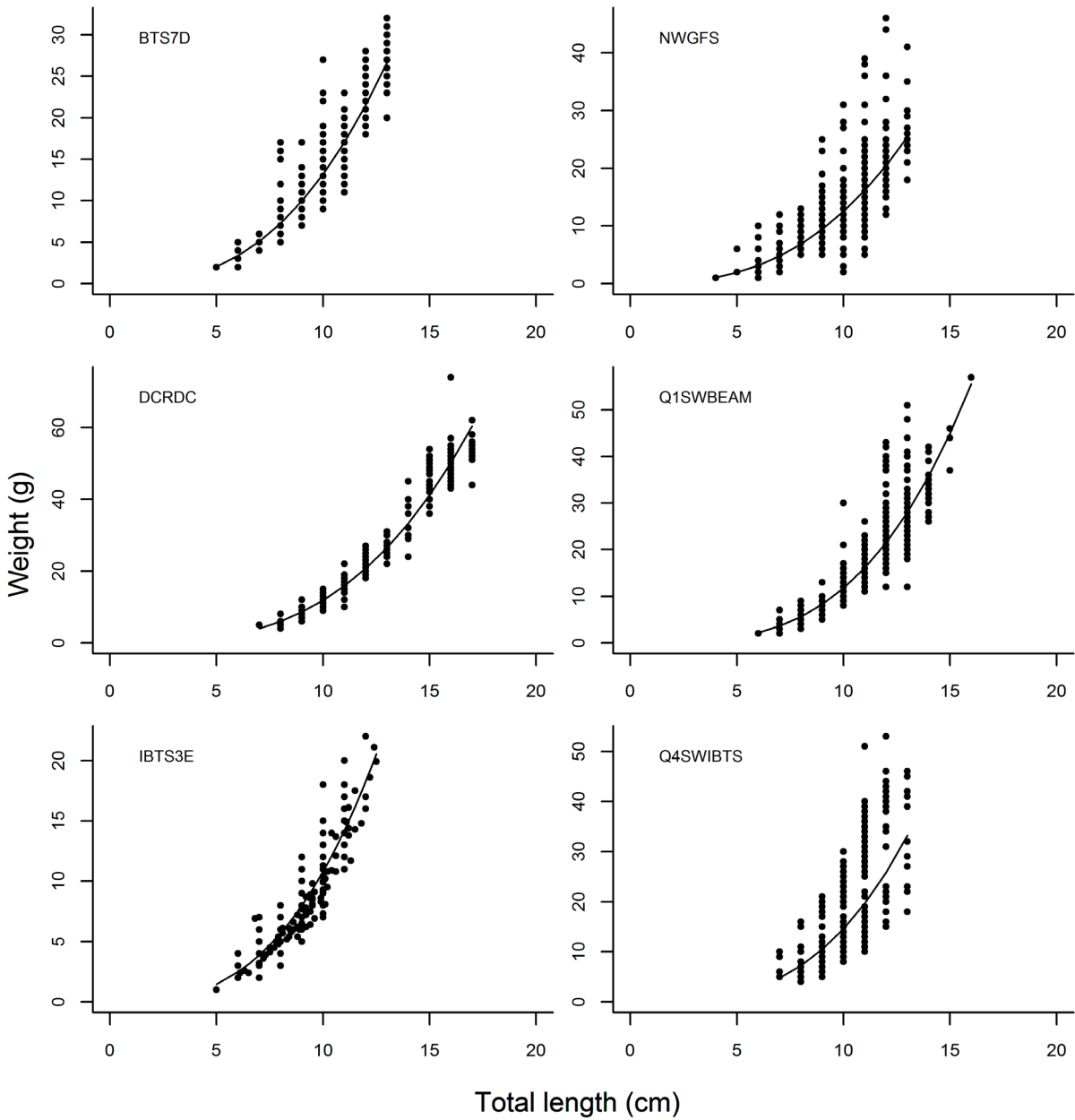
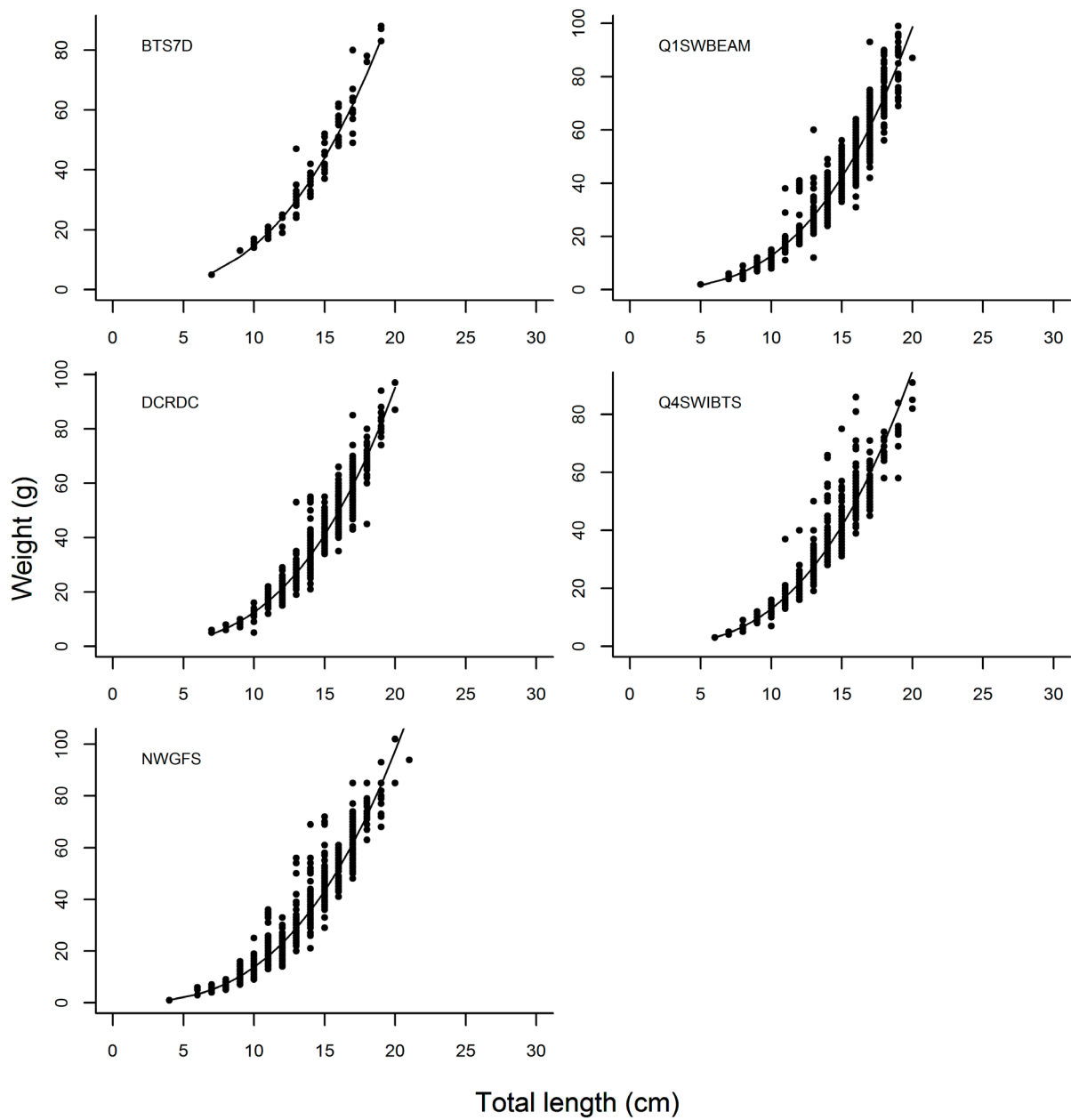


Figure 111: *Microchirus variegatus* Thickback sole

Head Office

Centre for Environment,
Fisheries & Aquaculture Science
Pakefield Road, Lowestoft,
Suffolk NR33 0HT, UK

Tel +44 (0) 1502 56 2244

Fax +44 (0) 1502 51 3865

Web www.cefass.defra.gov.uk

Cefas is an executive agency of Defra