



NOAA Technical Memorandum NMFS-SEFSC-693

doi:10.7289/V58G8HQ2

Length-Weight Relationships, Location, and Depth Distributions for Select Gulf of Mexico Reef Fish Species

By

Jeffrey R. Pulver and Andrew Whatley



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center
Galveston Laboratory
4700 Avenue U
Galveston, TX 77551

August 2016



NOAA Technical Memorandum NMFS-SEFSC-693

doi:10.7289/V58G8HQ2

LENGTH-WEIGHT RELATIONSHIPS, LOCATION, AND DEPTH DISTRIBUTIONS FOR
SELECT GULF OF MEXICO REEF FISH SPECIES

JEFFREY R. PULVER AND ANDREW WHATLEY
National Marine Fisheries Service
Southeast Fisheries Science Center
Galveston Laboratory
4700 Avenue U
Galveston, TX 77551

U. S. DEPARTMENT OF COMMERCE
Penny Pritzker, Secretary

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Kathryn Sullivan, Under Secretary for Oceans and Atmosphere

NATIONAL MARINE FISHERIES SERVICE
Eileen Sobeck, Assistant Administrator for Fisheries

August 2016

This Technical Memorandum series is used for documentation and timely communication of preliminary results, interim reports, or similar special-purpose information. Although the memoranda are not subject to complete formal review, editorial control, or detailed editing, they are expected to reflect sound professional work.

NOTICE

The National Marine Fisheries Service (NMFS) does not approve, recommend or endorse any proprietary product or material mentioned in this publication. No reference shall be made to NMFS or to this publication furnished by NMFS, in any advertising or sales promotion which would imply that NMFS approves, recommends, or endorses any proprietary product or proprietary material mentioned herein which has as its purpose any intent to cause directly or indirectly the advertised product to be used or purchased because of this NMFS publication.

This report should be cited as follows:

Pulver, J.R., and A. Whatley. 2016. Length-weight relationships, location, and depth distributions for select Gulf of Mexico reef fish species. NOAA Technical Memorandum NMFS-SEFSC-693, 100 p. doi:10.7289/V58G8HQ2

This report will be posted on the SEFSC Galveston Laboratory website at URL:
<http://www.galvestonlab.sefsc.noaa.gov/publications/index.html>

Copies may be obtained from:

Jeffrey R. Pulver
National Marine Fisheries Service
Galveston Laboratory
4700 Avenue U
Galveston, TX 77551
Voice: 409-766-3527
FAX: 409-766-3489
Jeff.Pulver@noaa.gov

List of Figures.	Page
Figure 1. NMFS statistical zones used by the observer program for the Gulf of Mexico and South Atlantic.	9
Figure 2. Mean lengths (\pm S.D.) for 90 reef fish species compared to its corresponding adjusted R^2 given by the length-weight regression model.	10
Figure 3. Regression model, location, and depth information for grouper, black (<i>Mycteroperca bonaci</i>).	11
Figure 4. Regression model, location, and depth information for gag (<i>Mycteroperca microlepis</i>).	12
Figure 5. Regression model, location, and depth information for grouper, yellowfin (<i>Mycteroperca venenosa</i>).	13
Figure 6. Regression model, location, and depth information for grouper, yellowmouth (<i>Mycteroperca interstitialis</i>).	14
Figure 7. Regression model, location, and depth information for scamp (<i>Mycteroperca phenax</i>).	15
Figure 8. Regression model, location, and depth information for grouper, red (<i>Epinephelus morio</i>).	16
Figure 9. Regression model, location, and depth information for grouper, snowy (<i>Epinephelus niveatus</i>).	17
Figure 10. Regression model, location, and depth information for grouper, yellowedge (<i>Epinephelus flavolimbatus</i>).	18
Figure 11. Regression model, location, and depth information for grouper, marbled (<i>Epinephelus inermis</i>).	19
Figure 12. Regression model, location, and depth information for hind, speckled (<i>Epinephelus drummondhayi</i>).	20
Figure 13. Regression model, location, and depth information for graysby (<i>Cephalopholis cruentata</i>).	21
Figure 14. Regression model, location, and depth information for hind, red (strawberry grouper) (<i>Epinephelus guttatus</i>).	22
Figure 15. Regression model, location, and depth information for hind, rock (<i>Epinephelus adscensionis</i>).	23
Figure 16. Regression model, location, and depth information for perch, sand (<i>Diplectrum formosum</i>).	24
Figure 17. Regression model, location, and depth information for seabass, black (<i>Centropristis striata</i>).	25
Figure 18. Regression model, location, and depth information for seabass, rock (<i>Centropristis philadelphica</i>).	26
Figure 19. Regression model, location, and depth information for seabass, bank (<i>Centropristis ocyurus</i>).	27
Figure 20. Regression model, location, and depth information for tattler (<i>Serranus phoebe</i>).	28
Figure 21. Regression model, location, and depth information for bass, longtail (<i>Hemanthias leptus</i>).	29

Figure 22. Regression model, location, and depth information for flag, spanish (<i>Gonioplectrus hispanus</i>).	30
Figure 23. Regression model, location, and depth information for creole-fish (<i>Paranthias furcifer</i>).	31
Figure 24. Regression model, location, and depth information for snapper, red (<i>Lutjanus campechanus</i>).	32
Figure 25. Regression model, location, and depth information for snapper, lane (<i>Lutjanus synagris</i>).	33
Figure 26. Regression model, location, and depth information for snapper, mutton (<i>Lutjanus analis</i>).	34
Figure 27. Regression model, location, and depth information for snapper, gray (<i>Lutjanus griseus</i>).	35
Figure 28. Regression model, location, and depth information for snapper, cubera (<i>Lutjanus cyanopterus</i>).	36
Figure 29. Regression model, location, and depth information for snapper, silk (<i>Lutjanus vivanus</i>).	37
Figure 30. Regression model, location, and depth information for snapper, vermilion (<i>Rhomboplites aurorubens</i>).	38
Figure 31. Regression model, location, and depth information for wenchman (<i>Pristipomoides aquilonaris</i>).	39
Figure 32. Regression model, location, and depth information for snapper, queen (<i>Etelis Oculatus</i>).	40
Figure 33. Regression model, location, and depth information for snapper, yellowtail (<i>Ocyurus chrysurus</i>).	41
Figure 34. Regression model, location, and depth information for tilefish (<i>Lopholatilus chamaeleonticeps</i>).	42
Figure 35. Regression model, location, and depth information for tilefish, blueline (<i>Caulolatilus microps</i>).	43
Figure 36. Regression model, location, and depth information for tilefish, goldface (<i>Caulolatilus chrysops</i>).	44
Figure 37. Regression model, location, and depth information for tilefish, sand (<i>Malacanthus plumieri</i>).	45
Figure 38. Regression model, location, and depth information for grunt, white (<i>Haemulon plumieri</i>).	46
Figure 39. Regression model, location, and depth information for tomtate (<i>Haemulon aurolineatum</i>).	47
Figure 40. Regression model, location, and depth information for porgy, red (<i>Pagrus pagrus</i>).	48
Figure 41. Regression model, location, and depth information for porgy, knobbed (<i>Calamus nodosus</i>).	49
Figure 42. Regression model, location, and depth information for porgy, saucereye (<i>Calamus calamus</i>).	50
Figure 43. Regression model, location, and depth information for porgy, jolthead (<i>Calamus bajonado</i>).	51

Figure 44. Regression model, location, and depth information for porgy, littlehead (<i>Calamus proridens</i>).	52
Figure 45. Regression model, location, and depth information for sheepshead (<i>Archosargus probatocephalus</i>).	53
Figure 46. Regression model, location, and depth information for porgy, whitebone (<i>Calamus leucosteus</i>).	54
Figure 47. Regression model, location, and depth information for rudderfish, banded (<i>Seriola zonata</i>).	55
Figure 48. Regression model, location, and depth information for amberjack, lesser (<i>Seriola fasciata</i>).	56
Figure 49. Regression model, location, and depth information for amberjack, greater (<i>Seriola dumerili</i>).	57
Figure 50. Regression model, location, and depth information for jack, almaco (<i>Seriola rivoliana</i>).	58
Figure 51. Regression model, location, and depth information for runner, blue (<i>Caranx crysos</i>).	59
Figure 52. Regression model, location, and depth information for jack, common crevalle (<i>Caranx hippos</i>).	60
Figure 53. Regression model, location, and depth information for rainbow runner (<i>Elagatis bipinnulata</i>).	61
Figure 54. Regression model, location, and depth information for pompano, florida (<i>Trachinotus carolinus</i>).	62
Figure 55. Regression model, location, and depth information for barrelfish (<i>Hyperoglyphe perciferomis</i>).	63
Figure 56. Regression model, location, and depth information for dolphin (<i>Coryphaena hippurus</i>).	64
Figure 57. Regression model, location, and depth information for bluefish (<i>Pomatomus saltatrix</i>).	65
Figure 58. Regression model, location, and depth information for cobia, ling (<i>Rachycentron canadum</i>).	66
Figure 59. Regression model, location, and depth information for tuna, blackfin (<i>Thunnus atlanticus</i>).	67
Figure 60. Regression model, location, and depth information for bonito (<i>Euthynnus alletteratus</i>).	68
Figure 61. Regression model, location, and depth information for mackerel, spanish (<i>Scomberomorus maculatus</i>).	69
Figure 62. Regression model, location, and depth information for mackerel, king (<i>Scomberomorus cavalla</i>).	70
Figure 63. Regression model, location, and depth information for mackerel, cero (<i>Scomberomorus regalis</i>).	71
Figure 64. Regression model, location, and depth information for wahoo (<i>Acanthocybium solandri</i>).	72
Figure 65. Regression model, location, and depth information for barracuda, great (<i>Sphyrna barracuda</i>).	73

Figure 66. Regression model, location, and depth information for triggerfish, gray (<i>Balistes capriscus</i>).	74
Figure 67. Regression model, location, and depth information for sharksucker (<i>Echeneis naucrates</i>).	75
Figure 68. Regression model, location, and depth information for drum, red (<i>Sciaenops ocellatus</i>).	76
Figure 69. Regression model, location, and depth information for bigeye (<i>Priacanthus arenatus</i>).	77
Figure 70. Regression model, location, and depth information for bigeye, short (<i>Pristigenys alta</i>).	78
Figure 71. Regression model, location, and depth information for squirrelfish (<i>Holocentrus adscensionis</i>).	79
Figure 72. Regression model, location, and depth information for scorpionfish, spinycheek (<i>Neomerinthe hemingwayi</i>).	80
Figure 73. Regression model, location, and depth information for rosefish, blackbelly (<i>Helicolenus dactylopterus</i>).	81
Figure 74. Regression model, location, and depth information for lionfish, red (<i>Pterois volitans</i>).	82
Figure 75. Regression model, location, and depth information for hogfish (<i>Lachnolaimus maximus</i>).	83
Figure 76. Regression model, location, and depth information for hogfish, red (<i>Decodon puellaris</i>).	84
Figure 77. Regression model, location, and depth information for toadfish, leopard (<i>Opsanus pardus</i>).	85
Figure 78. Regression model, location, and depth information for lizardfish, inshore (<i>Synodus foetens</i>).	86
Figure 79. Regression model, location, and depth information for snakefish (<i>Trachinocephalus myops</i>).	87
Figure 80. Regression model, location, and depth information for sand diver (<i>Synodus intermedius</i>).	88
Figure 81. Regression model, location, and depth information for shark, bonnethead (<i>Sphyrna tiburo</i>).	89
Figure 82. Regression model, location, and depth information for shark, bigeye sixgill (<i>Hexanchus vitulus</i>).	90
Figure 83. Regression model, location, and depth information for shark, sevengill (<i>Heptanchias perlo</i>).	91
Figure 84. Regression model, location, and depth information for dogfish, chain (<i>Scyliorhinus retifer</i>).	92
Figure 85. Regression model, location, and depth information for dogfish, roughskin (<i>Cirrhigaleus asper</i>).	93
Figure 86. Regression model, location, and depth information for dogfish, cuban (<i>Squalus cubensis</i>).	94
Figure 87. Regression model, location, and depth information for dogfish, shortspine (<i>Squalus mitsukurii</i>).	95

Figure 88. Regression model, location, and depth information for shark, smooth dogfish (<i>Mustelus canis</i>).	96
Figure 89. Regression model, location, and depth information for shark, atlantic sharpnose (<i>Rhizoprionodon terraenovae</i>).	97
Figure 90. Regression model, location, and depth information for shark, blacknose (<i>Carcharhinus acronotus</i>).	98
Figure 91. Regression model, location, and depth information for shark, finetooth (<i>Carcharhinus isodon</i>).	99
Figure 92. Regression model, location, and depth information for shark, silky (<i>Carcharhinus falciformis</i>).	100

Introduction

The NMFS Galveston Reef Fish Observer Program began mandatory coverage of the Gulf of Mexico commercial reef fish fishery in July 2006. Since that time the program has recorded catch data from vessels using multiple gear types (vertical line, bottom longline, spearfishing, and buoy fishing) across broad spatial and temporal scales (Scott-Denton et al., 2011; Scott-Denton and Williams, 2013). While at-sea, fishery observers record characteristics of individual captured fish such as length, weight, discard disposition, location, and other environmental factors (NMFS, 2016). Length and weight data obtained from at-sea fishery observer programs are often useful because they include information about species not landed, e.g. non-target species, or for size ranges of target species typically discarded at-sea. Length-weight regression models are used extensively to estimate weight from length because of the technical difficulties in obtaining accurate weights while in the field. The purpose of this document is to provide length-weight relationships, location, and depth distributions for target and non-target reef fish species using data collected by the Galveston Reef Fish Observer Program from July 2006 through December 2015.

Methods

The reef fish database contained catch information for 1,062,857 individual captures of fish by all gear types representing 336 different taxonomic categories. Only taxonomic categories at the species level, e.g. not genus or family level, which had ≥ 5 paired length-weight observations were included in this study. Total, fork, or standard lengths were recorded to the nearest mm and weights were primarily obtained using 10-kg model 235-6S Salter¹ scales (accuracy ± 0.05 kg),

¹ Mention of trade names or commercial companies is for identification purposes only and does not imply endorsement by the National Marine Fisheries Service, NOAA.

but throughout the history of the program various brands of digital scales (accuracy ± 0.01 kg) have also been used to obtain weights. Length-weight regression models were fit to species using the most common pairing observed between length measurement type and weight type (whole or gutted), e.g. fork and whole. Log-transformed length and weight data were fit using ordinary least squares with the following equation where \ln = natural log, W = weight (kg), L =length (mm), a = y-intercept, and b = slope:

$$(1) \quad \ln W = \ln a + b \ln L$$

For each species, the predicted fit from the resulting linear regression equations were plotted with 95% confidence intervals against a scatterplot of the observed data. Model fit information given in the results includes the number of observations used to fit the model, the adjusted R^2 coefficient of determination, and residual standard error (RSE). To predict weight from length using the model, the following equation is given for each species as:

$$(2) \quad Weight = \exp(\ln a) * Length^b$$

Also included is the most common final disposition (kept, discarded alive, discarded dead, used for bait, or unknown) for each species recorded by the program. The number of all captures observed in each statistical zone (Figure 1) for each species category was tabulated and included as a bar chart. Finally, a histogram of capture depths was generated with an estimated kernel density probability estimate included for each species. All analyses in this study were performed using R statistical software (version 3.3.0; R Development Core Team, 2016)

Results/Discussion

Significant (p -value < 0.05) length-weight regression models were fit using 641,251 captures for 90 unique species (Table 1). Three species, red grouper (*Epinephelus morio*), vermilion

snapper (*Rhomboplites aurorubens*), and red snapper (*Lutjanus campechanus*) represented the majority (> 75%) of the paired length-weight observations available. The average number of paired observations used to fit each model was 7,125 and ranged from a minimum of five observations for red hogfish (*Decodon puellaris*) to a maximum of 254,416 for red grouper. The most common (65%) paired measurements used to fit a model were fork lengths to predict whole weight. Lengths used to fit the models ranged from a minimum of 83 mm standard length for bank seabass (*Centropristis ocyurus*) to a maximum of 1683 mm total length for silky sharks (*Carcharhinus falciformis*). The mutton snapper (*Lutjanus analis*) regression model had the lowest RSE (< 0.09) of any species in this study with only five models having a RSE > 0.4.

The average adjusted R^2 was 0.79 (0.22 S.D.) and ranged from a low of 0.05 to the highest value of 0.99 for dolphin (*Coryphaena hippurus*). The majority (60) of the species length-weight regression models had an adjusted $R^2 > 0.8$. The seven species that had > 10,000 paired observations all had excellent fits with an adjusted $R^2 > 0.85$. Only 11 length-weight regression models had an adjusted $R^2 < 0.5$ with the lowest value (0.05) observed for tattler (*Serranus phoebe*); however, only 89 tattler paired measurements were available over a small length (123–206 mm) and weight (0.03–0.25 kg) range. Generally, species with smaller mean lengths accounted for the smaller adjusted R^2 observed (Figure 2). The smaller adjusted R^2 observed were possibly due to increased variance at lighter weights caused by the resolution of the Salter scales (accuracy ± 0.05 kg).

Despite the difficulties in obtaining accurate weights in the at-sea environment, the Galveston Reef Fish Observer Program has collected high quality length and weight data for a large number of commercially important fish species in the Gulf of Mexico. These length-weight and additional data should be useful to other researchers wishing to explore temporal or spatial

variations in the reef fish fishery to derive conclusions benefitting the long-term management of the fishery.

References

- NMFS. 2016. Characterization of the U.S. Gulf of Mexico and southeastern Atlantic otter trawl and bottom reef fish fisheries. Observer Training Manual. NMFS, Southeast Fisheries Science Center, Galveston Laboratory, Galveston, Texas. Available at http://www.galvestonlab.sefsc.noaa.gov/forms/observer/obs_training_manual_12_2015.pdf
- R Development Core Team. 2016. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0.
- Scott-Denton, E., Cryer, P.F., Gocke, J.P., Harrelson, M.R., Kinsella, D.J., Pulver, J.R., Smith, R.C., and Williams, J.A., 2011. Descriptions of the U.S. Gulf of Mexico reef fish bottom longline and vertical line fisheries based on observer data. *Mar. Fish. Rev.* 73(2): 1-26.
- Scott-Denton, E., and Williams, J.A., 2013. Observer Coverage of the 2010-2011 Gulf of Mexico Reef Fish. NOAA Technical Memorandum. NMFS-SEFSC-646, 65 pp.

Table 1. Regression model information for the 90 reef fish species including the number of observations (N), minimum length in mm (Min) and maximum length in mm (Max), mean length in mm, length standard deviation (S.D.), y-intercept (Ln *a*), slope (*b*), standard error of the slope (SE *b*), residual standard error (RSE), adjusted R^2 , R^2 , and overall regression model significance (*p*-value).

Common Name	Scientific Name	N	Min (mm)	Max (mm)	Mean (mm)	S.D.	Ln <i>a</i>	<i>b</i>	SE <i>b</i>	RSE	Adjusted R^2	R^2	<i>p</i> -value
Grouper, Black	<i>Mycteroperca bonaci</i>	182	633	1,410	964.8	168.2	-18.3	3.04	0.06	0.14	0.93	0.93	<0.01
Gag	<i>Mycteroperca microlepis</i>	13,669	236	1,399	675.5	144.2	-17.9	2.96	0.01	0.13	0.96	0.96	<0.01
Grouper, Yellowfin	<i>Mycteroperca venenosa</i>	6	425	858	646.3	173.4	-18.1	3.01	0.21	0.13	0.98	0.98	<0.01
Grouper, Yellowmouth	<i>Mycteroperca interstitialis</i>	21	398	668	567.8	76.9	-16.5	2.74	0.26	0.17	0.85	0.86	<0.01
Scamp	<i>Mycteroperca phenax</i>	6,385	221	951	554.9	103.9	-17.1	2.80	0.01	0.18	0.90	0.90	<0.01
Grouper, Red	<i>Epinephelus morio</i>	254,416	199	924	475.2	95.5	-18.8	3.13	0.00	0.13	0.96	0.96	<0.01
Grouper, Snowy	<i>Epinephelus niveatus</i>	3,600	284	1,233	637.5	124.2	-18.2	3.01	0.01	0.13	0.95	0.95	<0.01
Grouper, Yellowedge	<i>Epinephelus flavolimbatus</i>	18,986	284	1,153	652.7	115.9	-18.1	2.99	0.00	0.12	0.95	0.95	<0.01
Grouper, Marbled	<i>Epinephelus inermis</i>	16	519	877	677.6	111.6	-19.7	3.27	0.24	0.15	0.92	0.93	<0.01
Hind, Speckled	<i>Epinephelus drummondhayi</i>	1,077	241	1,092	528.9	148.0	-18.5	3.11	0.02	0.16	0.97	0.97	<0.01
Graysby	<i>Cephalopholis cruentata</i>	53	178	518	273.4	52.7	-13.4	2.21	0.24	0.31	0.62	0.62	<0.01
Hind, Red	<i>Epinephelus guttatus</i>	17	231	546	384.6	83.0	-16.7	2.78	0.29	0.26	0.85	0.86	<0.01
Hind, Rock	<i>Epinephelus adscensionis</i>	88	229	426	355.3	42.4	-19.1	3.20	0.16	0.19	0.82	0.82	<0.01
Perch, Sand	<i>Diplacrum formosum</i>	364	126	320	212.3	28.4	-10.1	1.56	0.13	0.34	0.27	0.27	<0.01
Seabass, Black	<i>Centropristis striata</i>	642	134	457	266.2	51.1	-14.4	2.42	0.07	0.34	0.66	0.66	<0.01
Seabass, Rock	<i>Centropristis philadelphica</i>	247	106	318	201.1	38.2	-15.2	2.53	0.18	0.56	0.44	0.44	<0.01
Seabass, Bank	<i>Centropristis ocyurus</i>	175	83	470	205.7	46.8	-9.2	1.45	0.11	0.32	0.48	0.48	<0.01
Tattler	<i>Serranus phoebe</i>	89	123	206	174.6	14.1	-10.0	1.47	0.60	0.47	0.05	0.06	0.02
Bass, Longtail	<i>Hemanthias leptus</i>	84	248	555	411.0	65.3	-15.5	2.55	0.10	0.16	0.88	0.88	<0.01
Flag, Spanish	<i>Gonioplectrus hispanus</i>	18	216	278	246.1	21.4	-13.0	2.14	0.66	0.24	0.36	0.40	<0.01
Creole-Fish	<i>Paranthias furcifer</i>	639	215	403	296.2	35.3	-11.9	1.93	0.09	0.27	0.41	0.41	<0.01
Snapper, Red	<i>Lutjanus campechanus</i>	110,897	172	990	460.4	112.4	-17.7	2.96	0.00	0.14	0.96	0.96	<0.01

(Table 1, continued)

Common Name	Scientific Name	N	Min (mm)	Max (mm)	Mean (mm)	S.D.	Ln a	b	SE b	RSE	Adjusted R ²	R ²	p-value
Snapper, Lane	<i>Lutjanus synagris</i>	2,330	162	513	322.0	47.7	-16.8	2.80	0.03	0.25	0.74	0.74	<0.01
Snapper, Mutton	<i>Lutjanus analis</i>	2,502	378	864	598.0	88.7	-17.7	2.96	0.01	0.09	0.96	0.96	<0.01
Snapper, Gray	<i>Lutjanus griseus</i>	4,001	219	714	426.2	76.1	-17.5	2.92	0.01	0.16	0.92	0.92	<0.01
Snapper, Cubera	<i>Lutjanus cyanopterus</i>	7	597	1,037	805.3	160.0	-16.5	2.78	0.17	0.09	0.98	0.98	<0.01
Snapper, Silk	<i>Lutjanus vivanus</i>	785	220	810	440.4	72.3	-18.6	3.11	0.02	0.11	0.95	0.95	<0.01
Snapper, Vermilion	<i>Rhomboplites aurorubens</i>	117,080	106	624	291.0	51.0	-17.8	2.98	0.00	0.21	0.85	0.85	<0.01
Wenchman	<i>Pristipomoides aquilonaris</i>	146	155	365	218.1	24.5	-15.2	2.51	0.30	0.39	0.32	0.33	<0.01
Snapper, Queen	<i>Etelis Oculatus</i>	328	200	912	549.9	119.2	-16.1	2.69	0.04	0.17	0.94	0.93	<0.01
Snapper, Yellowtail	<i>Ocyurus chrysurus</i>	7,740	168	512	300.0	42.7	-17.6	2.95	0.01	0.18	0.84	0.84	<0.01
Tilefish	<i>Lopholatilus chamaeleonticeps</i>	11,304	316	1,023	631.8	123.0	-20.2	3.29	0.01	0.15	0.95	0.94	<0.01
Tilefish, Blueline	<i>Caulolatilus microps</i>	6,558	319	810	553.6	63.2	-18.8	3.09	0.01	0.10	0.92	0.92	<0.01
Tilefish, Goldface	<i>Caulolatilus chrysops</i>	70	243	602	448.8	75.6	-19.8	3.27	0.15	0.23	0.87	0.88	<0.01
Tilefish, Sand	<i>Malacanthus plumieri</i>	144	313	632	504.4	61.2	-19.6	3.15	0.10	0.16	0.87	0.87	<0.01
Grunt, White	<i>Haemulon plumieri</i>	2,463	162	743	283.6	41.9	-18.3	3.09	0.03	0.22	0.78	0.78	<0.01
Tomtate	<i>Haemulon aurolineatum</i>	1,306	121	427	205.2	25.0	-17.2	2.86	0.10	0.43	0.38	0.38	<0.01
Porgy, Red	<i>Pagrus pagrus</i>	35,784	114	651	287.3	47.7	-17.0	2.88	0.01	0.19	0.86	0.86	<0.01
Porgy, Knobbed	<i>Calamus nodosus</i>	1,135	205	548	307.6	35.4	-16.4	2.79	0.04	0.15	0.81	0.81	<0.01
Porgy, Saucereye	<i>Calamus calamus</i>	414	189	549	300.0	36.6	-16.2	2.75	0.06	0.14	0.86	0.86	<0.01
Porgy, Jolthead	<i>Calamus bajonado</i>	1,097	192	700	422.9	111.2	-17.2	2.93	0.02	0.15	0.97	0.97	<0.01
Porgy, Littlehead	<i>Calamus proridens</i>	490	191	410	290.6	38.9	-17.2	2.92	0.07	0.22	0.76	0.76	<0.01
Sheepshead	<i>Archosargus probatocephalus</i>	238	277	562	399.8	57.4	-19.7	3.36	0.08	0.17	0.89	0.89	<0.01
Porgy, Whitebone	<i>Calamus leucosteus</i>	123	200	578	311.0	58.2	-17.6	2.97	0.16	0.31	0.73	0.74	<0.01
Rudderfish, Banded	<i>Seriola zonata</i>	1,657	241	752	427.4	70.8	-16.3	2.72	0.02	0.15	0.91	0.91	<0.01
Amberjack, Lesser	<i>Seriola fasciata</i>	286	186	950	409.9	105.6	-15.7	2.63	0.04	0.17	0.93	0.93	<0.01
Amberjack, Greater	<i>Seriola dumerili</i>	2,323	222	1,600	787.4	287.4	-16.0	2.69	0.01	0.16	0.98	0.98	<0.01

(Table 1, continued)

Common Name	Scientific Name	N	Min (mm)	Max (mm)	Mean (mm)	S.D.	Ln a	b	SE b	RSE	Adjusted R ²	R ²	p-value
Jack, Almaco	<i>Seriola rivoliana</i>	2,058	165	1,302	516.9	170.5	-16.2	2.73	0.01	0.16	0.97	0.97	<0.01
Runner, Blue	<i>Caranx crysos</i>	1,165	157	532	329.6	53.0	-17.3	2.90	0.03	0.19	0.87	0.87	<0.01
Jack, Common Crevalle	<i>Caranx hippos</i>	81	242	957	594.7	226.0	-15.2	2.59	0.04	0.15	0.98	0.98	<0.01
Rainbow Runner	<i>Elagatis bipinnulata</i>	26	272	663	465.2	108.6	-16.2	2.69	0.16	0.20	0.91	0.92	<0.01
Pompano, Florida	<i>Trachinotus carolinus</i>	111	300	426	357.8	30.4	-20.3	3.45	0.15	0.13	0.84	0.84	<0.01
Barrelfish	<i>Hyperoglyphe perciferomis</i>	256	277	815	630.0	99.1	-17.0	2.87	0.03	0.09	0.97	0.97	<0.01
Dolphin	<i>Coryphaena hippurus</i>	329	292	1,227	573.5	289.2	-17.0	2.74	0.02	0.13	0.99	0.99	<0.01
Bluefish	<i>Pomatomus saltatrix</i>	224	266	803	418.6	64.4	-18.1	2.99	0.06	0.13	0.92	0.92	<0.01
Cobia, Ling	<i>Rachycentron canadum</i>	165	400	1,330	824.1	173.3	-20.1	3.26	0.06	0.15	0.96	0.96	<0.01
Tuna, Blackfin	<i>Thunnus atlanticus</i>	255	499	890	724.5	71.9	-16.6	2.83	0.06	0.09	0.91	0.91	<0.01
Bonito	<i>Euthynnus alletteratus</i>	821	277	837	643.3	91.2	-17.0	2.84	0.03	0.12	0.94	0.94	<0.01
Mackerel, Spanish	<i>Scomberomorus maculatus</i>	62	337	678	512.3	80.0	-18.9	3.04	0.13	0.16	0.90	0.91	<0.01
Mackerel, King	<i>Scomberomorus cavalla</i>	2,585	476	1,309	813.8	114.0	-18.6	2.98	0.02	0.11	0.93	0.93	<0.01
Mackerel, Cero	<i>Scomberomorus regalis</i>	24	337	710	463.1	85.9	-20.1	3.25	0.31	0.26	0.83	0.83	<0.01
Wahoo	<i>Acanthocybium solandri</i>	24	925	1,591	1278.4	188.2	-21.2	3.32	0.33	0.24	0.82	0.83	<0.01
Barracuda, Great	<i>Sphyræna barracuda</i>	350	346	1,478	907.2	164.9	-18.4	2.94	0.05	0.20	0.90	0.90	<0.01
Triggerfish, Gray	<i>Balistes capriscus</i>	3,211	178	694	379.0	64.3	-16.8	2.85	0.02	0.17	0.88	0.88	<0.01
Sharksucker	<i>Echeneis naucrates</i>	896	257	984	704.6	95.2	-16.3	2.53	0.04	0.21	0.80	0.80	<0.01
Drum, Red	<i>Sciaenops ocellatus</i>	100	538	1,143	795.6	133.2	-19.2	3.14	0.09	0.15	0.93	0.93	<0.01
Bigeye	<i>Priacanthus arenatus</i>	90	191	572	336.2	60.0	-16.2	2.68	0.12	0.19	0.85	0.86	<0.01
Bigeye, Short	<i>Pristigenys alta</i>	124	181	326	259.7	24.4	-16.2	2.75	0.22	0.25	0.55	0.55	<0.01
Squirrelfish	<i>Holocentrus adscensionis</i>	237	178	386	281.4	28.5	-11.3	1.86	0.18	0.30	0.30	0.30	<0.01
Scorpionfish, Spinycheek	<i>Neomerinthe hemingwayi</i>	346	216	602	426.8	47.6	-18.0	2.97	0.10	0.21	0.74	0.74	<0.01
Rosefish, Blackbelly	<i>Helicolenus dactylopterus</i>	34	261	492	374.9	57.8	-14.8	2.46	0.20	0.18	0.82	0.82	<0.01
Lionfish, Red	<i>Pterois volitans</i>	71	169	407	295.0	59.3	-16.5	2.71	0.16	0.29	0.81	0.81	<0.01

(Table 1, continued)

Common Name	Scientific Name	N	Min (mm)	Max (mm)	Mean (mm)	S.D.	Ln a	b	SE b	RSE	Adjusted R ²	R ²	p-value
Hogfish	<i>Lachnolaimus maximus</i>	723	234	733	392.0	65.6	-14.5	2.44	0.05	0.20	0.78	0.78	<0.01
Hogfish, Red	<i>Decodon puellaris</i>	5	219	406	277.2	73.9	-18.3	3.06	0.36	0.17	0.95	0.96	<0.01
Toadfish, Leopard	<i>Opsanus pardus</i>	564	193	583	340.6	51.3	-14.5	2.45	0.09	0.32	0.57	0.57	<0.01
Lizardfish, Inshore	<i>Synodus foetens</i>	256	235	475	348.5	42.5	-17.1	2.72	0.15	0.30	0.55	0.55	<0.01
Snakefish	<i>Trachinocephalus myops</i>	230	184	403	249.0	41.2	-8.5	1.21	0.20	0.47	0.14	0.14	<0.01
Sand Diver	<i>Synodus intermedius</i>	650	210	471	328.2	50.6	-15.7	2.51	0.09	0.34	0.57	0.57	<0.01
Shark, Bonnethead	<i>Sphyrna tiburo</i>	12	621	1,010	850.0	100.7	-12.9	2.06	0.47	0.20	0.62	0.66	<0.01
Shark, Bigeye Sixgill	<i>Hexanchus vitulus</i>	134	474	1,251	796.4	156.8	-15.8	2.48	0.13	0.31	0.73	0.73	<0.01
Shark, Sevengill	<i>Heptanchias perlo</i>	62	701	1,074	887.6	98.5	-18.8	2.89	0.21	0.18	0.76	0.76	<0.01
Dogfish, Chain	<i>Scyliorhinus retifer</i>	46	345	557	476.0	53.1	-9.4	1.45	0.56	0.44	0.11	0.13	0.01
Dogfish, Roughskin	<i>Cirrhigaleus asper</i>	20	421	1,113	834.7	185.6	-19.1	3.02	0.15	0.17	0.96	0.96	<0.01
Dogfish, Cuban	<i>Squalus cubensis</i>	2,981	269	1,136	538.3	82.7	-17.6	2.77	0.03	0.23	0.74	0.74	<0.01
Dogfish, Shortspine	<i>Squalus mitsukurii</i>	106	433	814	707.1	57.5	-18.9	2.98	0.11	0.10	0.89	0.89	<0.01
Shark, Smooth Dogfish	<i>Mustelus canis</i>	1,929	460	1,460	1023.2	183.4	-21.6	3.33	0.02	0.21	0.90	0.90	<0.01
Shark, Atlantic Sharpnose	<i>Rhizoprionodon terraenovae</i>	6,540	269	1,300	814.5	99.9	-18.7	2.91	0.02	0.19	0.79	0.79	<0.01
Shark, Blacknose	<i>Carcharhinus acronotus</i>	1,045	552	1,294	864.9	149.2	-19.0	3.00	0.03	0.19	0.88	0.88	<0.01
Shark, Finetooth	<i>Carcharhinus isodon</i>	10	661	1,167	902.5	155.2	-14.5	2.33	0.64	0.34	0.57	0.62	0.01
Shark, Silky	<i>Carcharhinus falciformis</i>	311	652	1,683	934.2	147.3	-19.0	2.98	0.07	0.18	0.86	0.86	<0.01

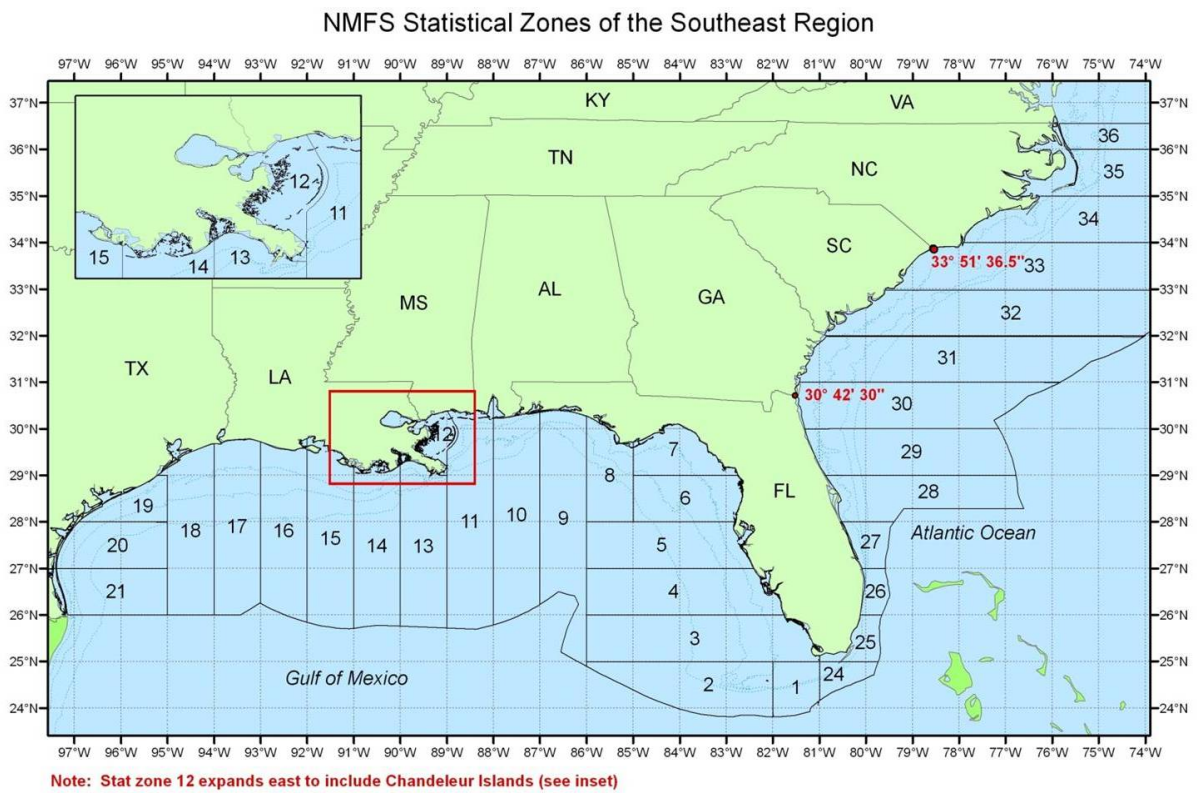


Figure 1. NMFS statistical zones used by the observer program for the Gulf of Mexico and South Atlantic.

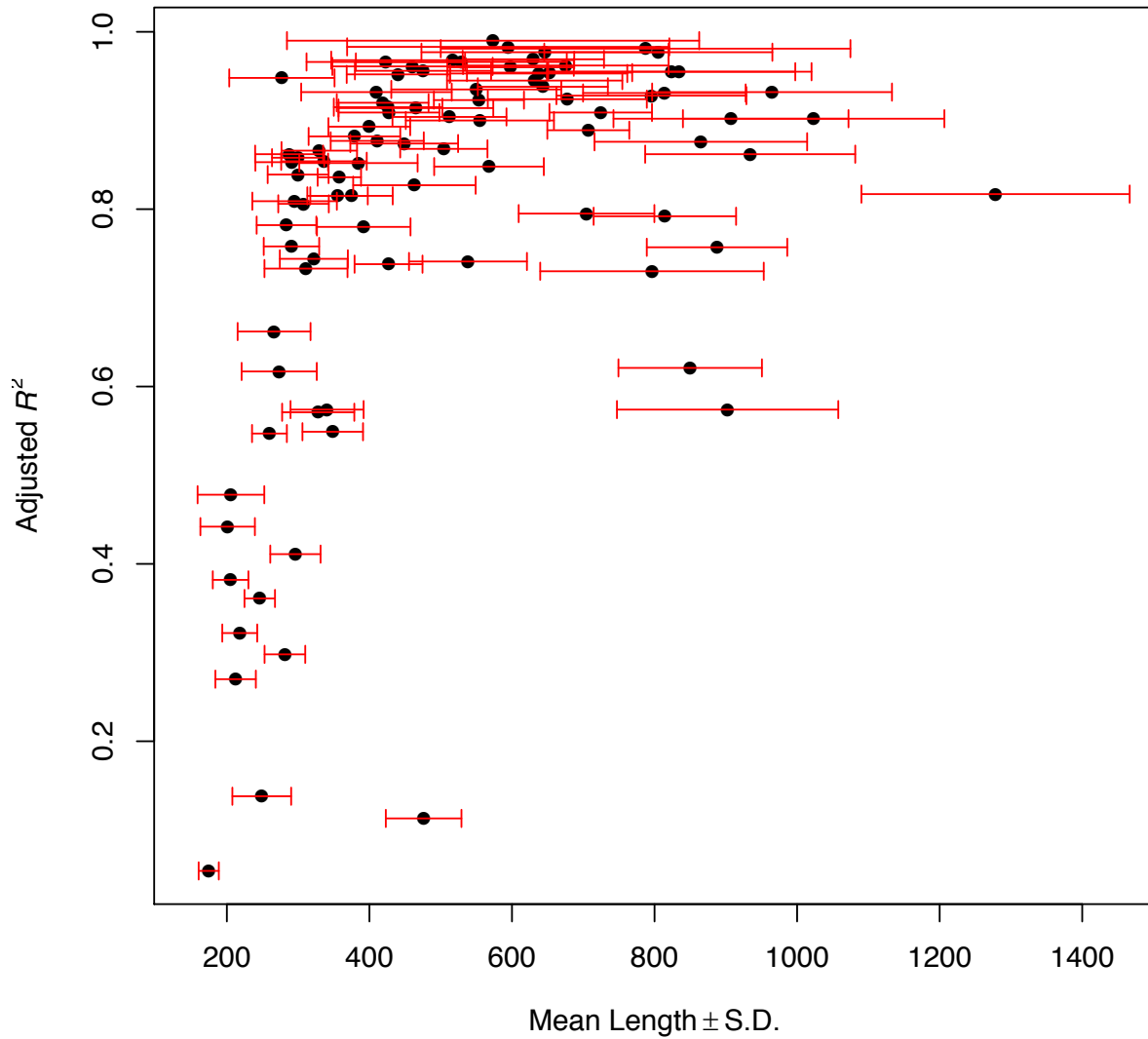
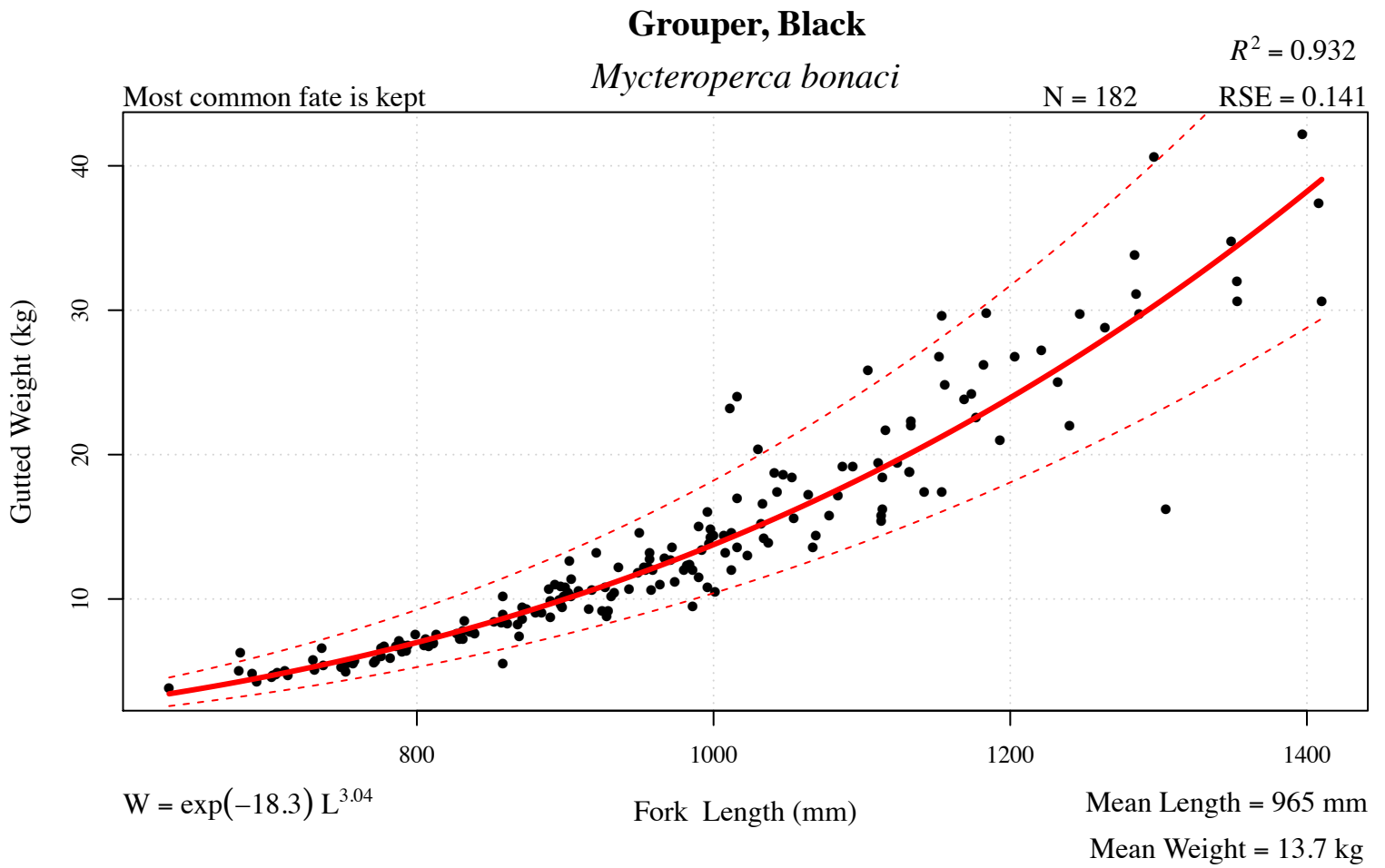


Figure 2. Mean lengths (\pm S.D.) for 90 reef fish species compared to its corresponding adjusted R^2 given by the length-weight regression model.



More common in the Eastern Gulf

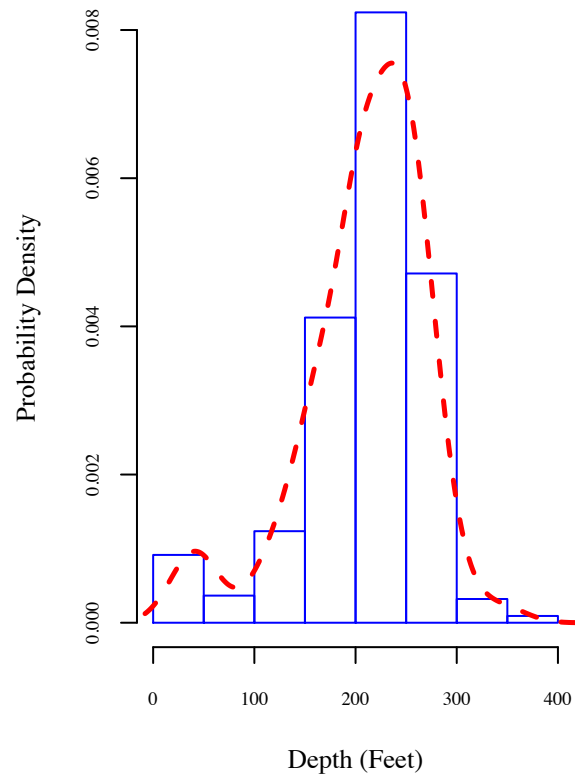
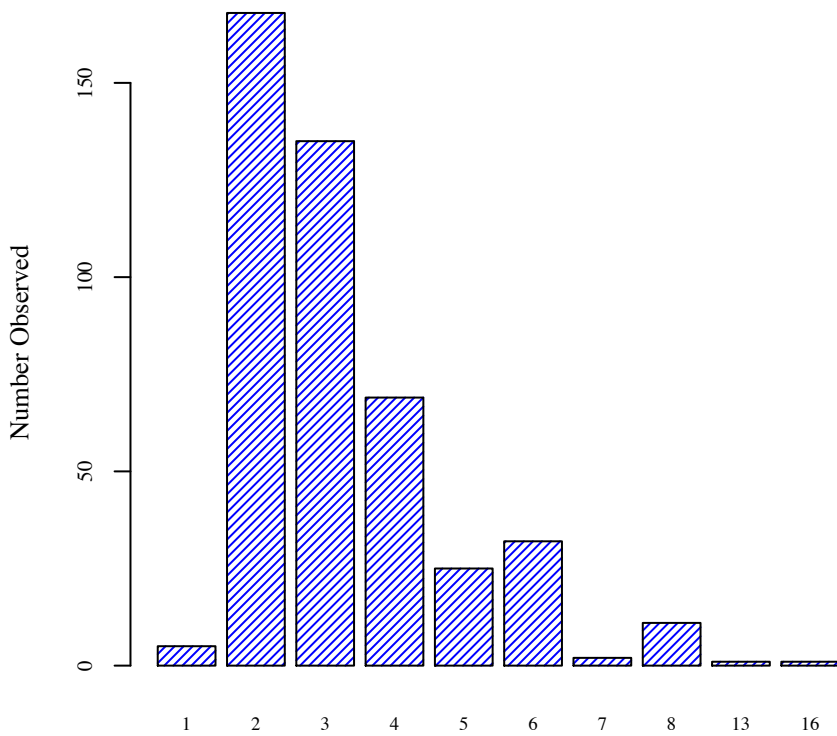
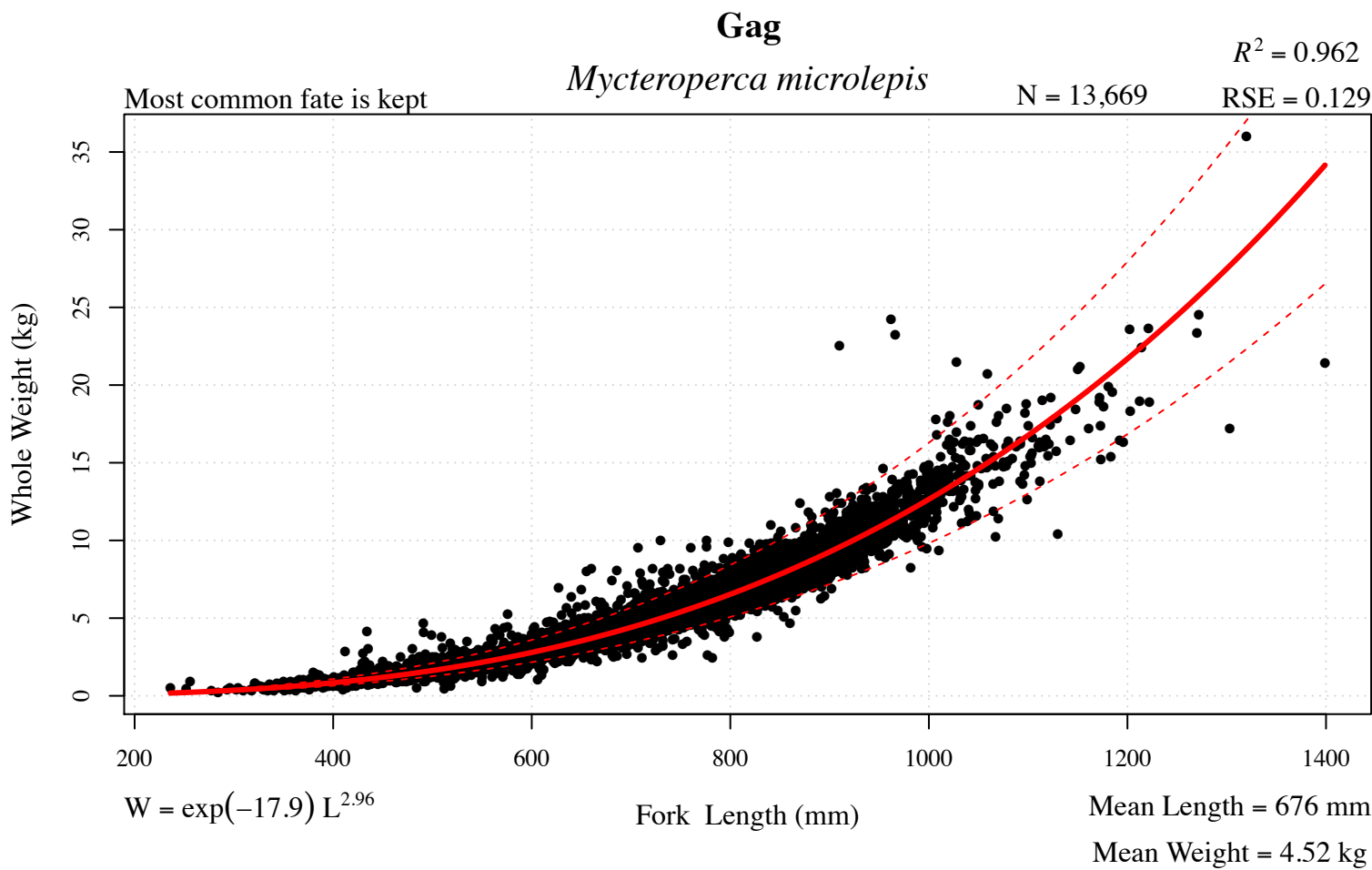


Figure 3 . Regression model, location, and depth information for grouper, black (*Mycteroperca bonaci*).



More common in the Eastern Gulf

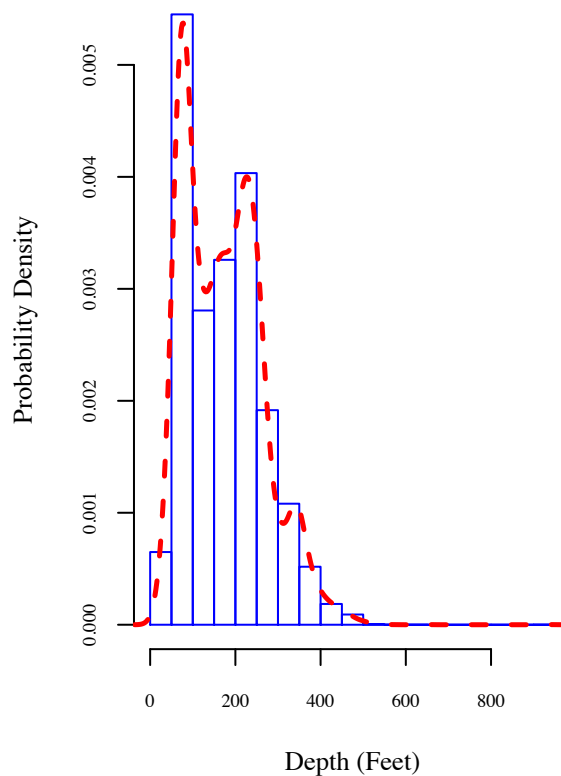
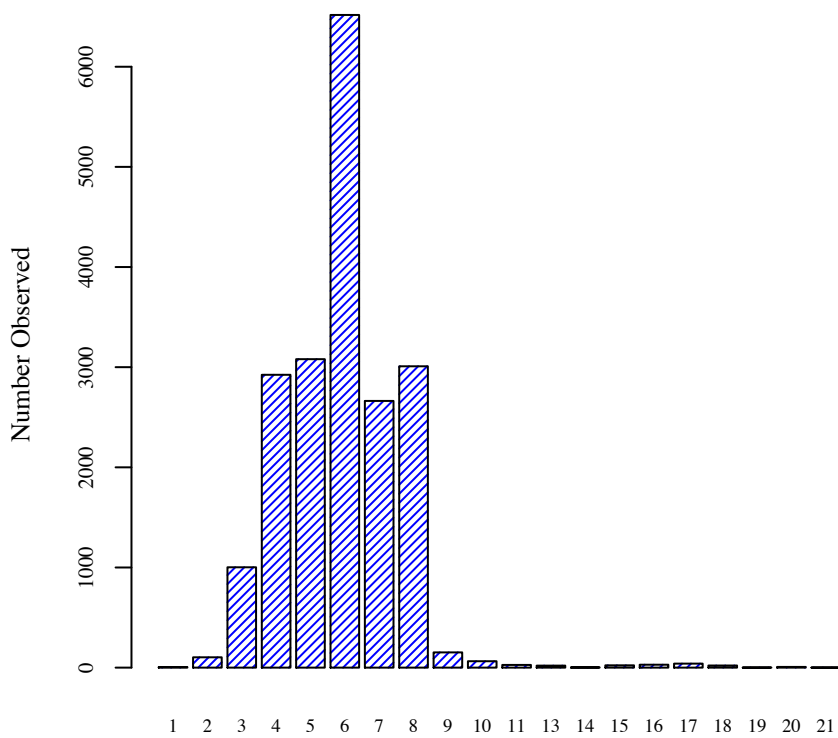
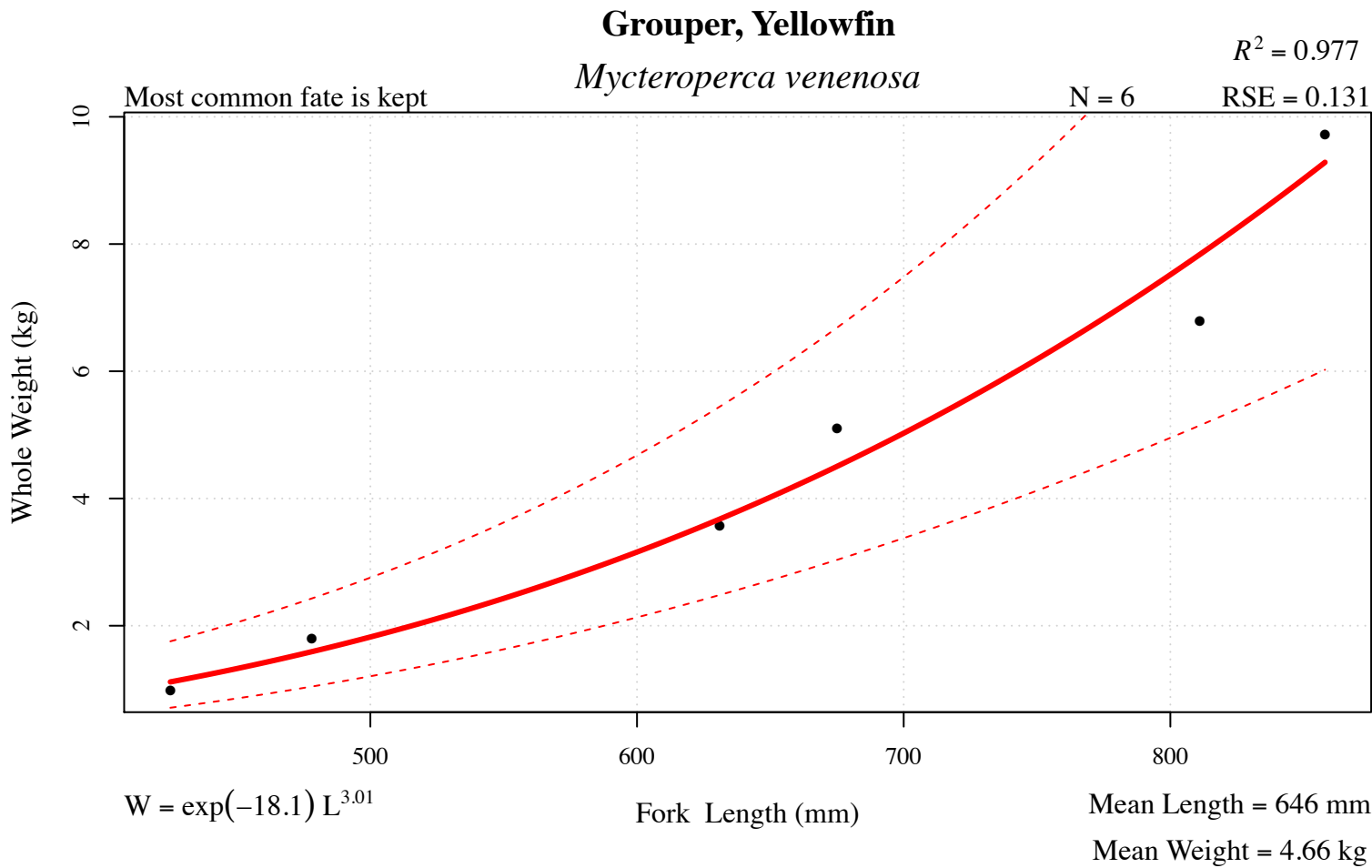


Figure 4 . Regression model, location, and depth information for gag (*Mycteroperca microlepis*).



More common in the Eastern Gulf

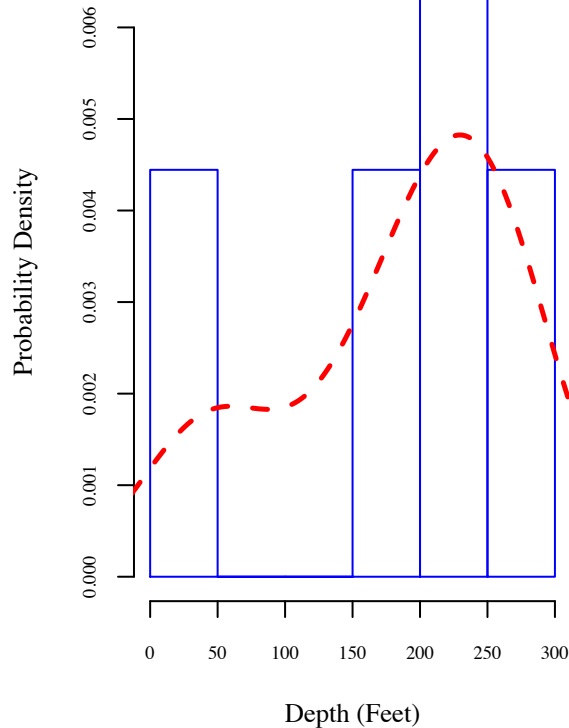
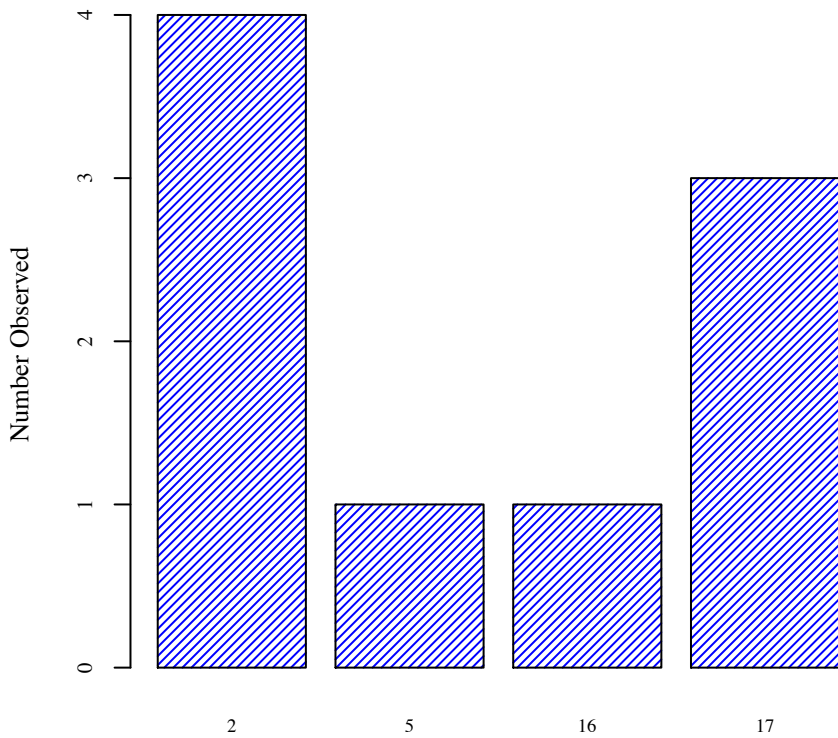
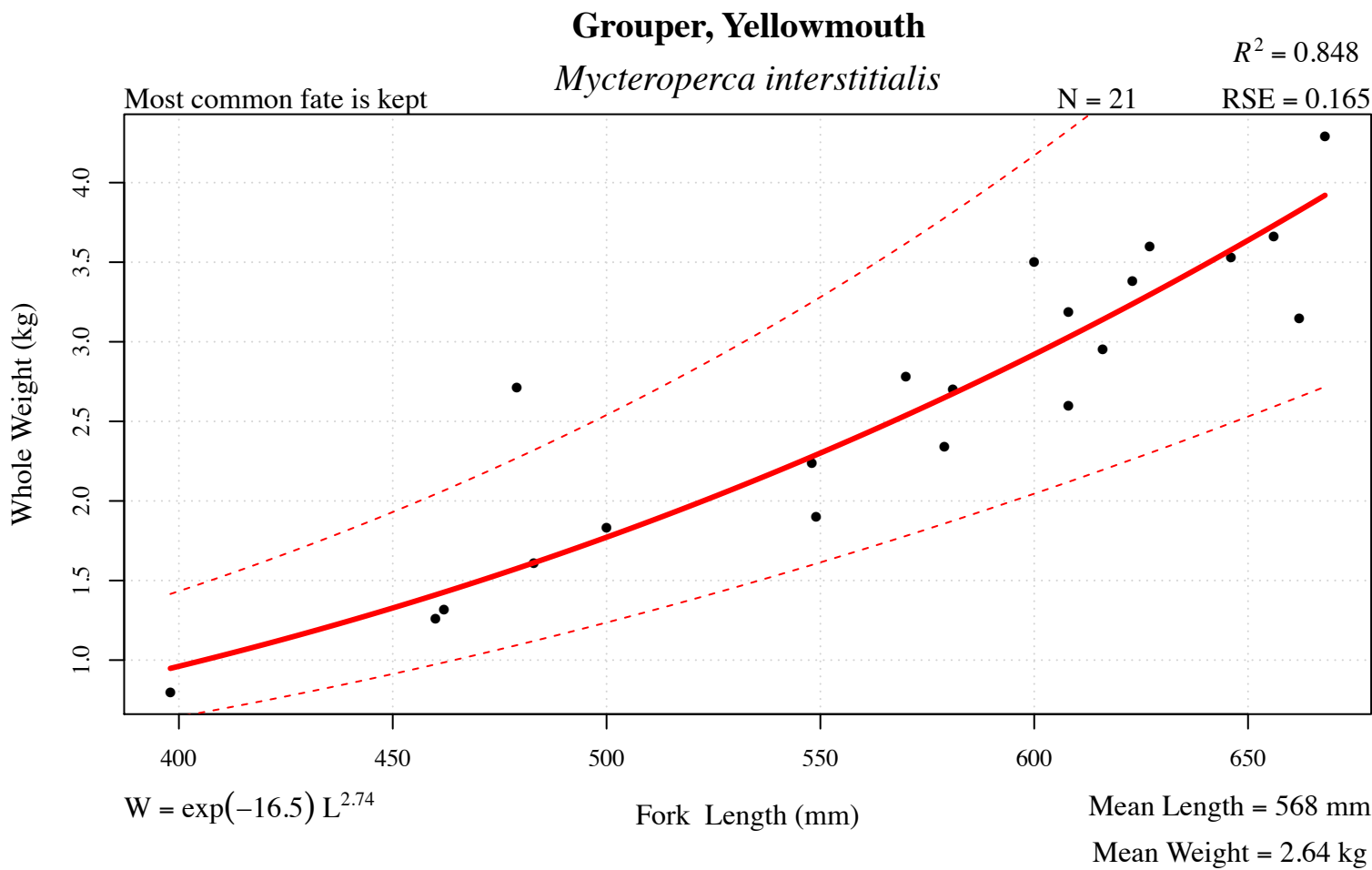
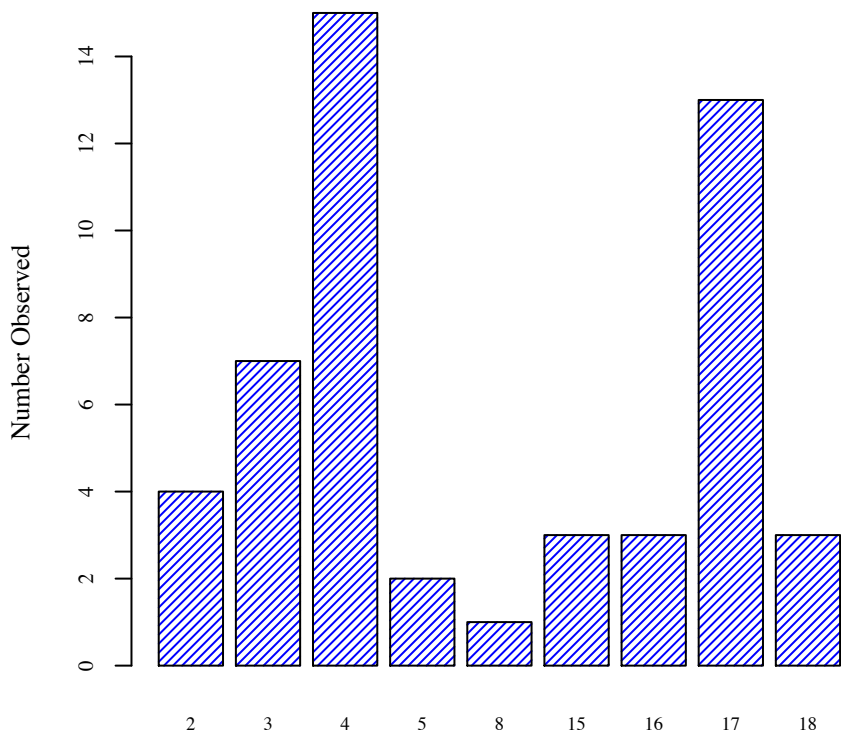


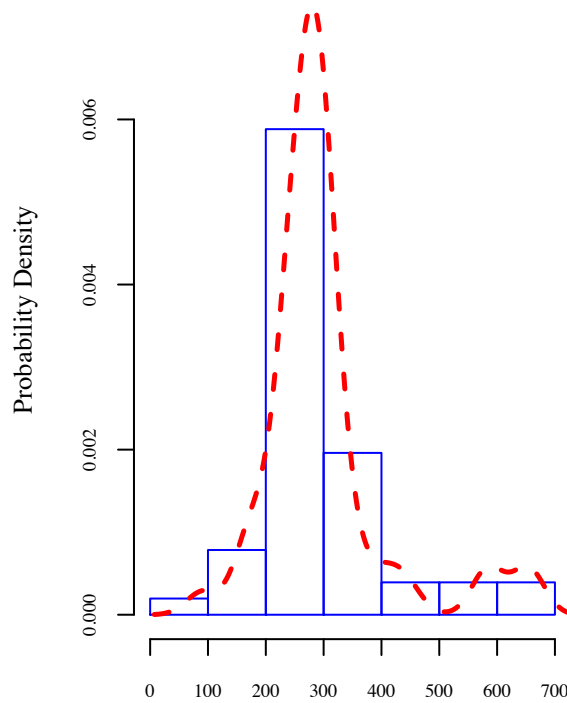
Figure 5 . Regression model, location, and depth information for grouper, yellowfin (*Mycteroperca venenosa*).



More common in the Eastern Gulf

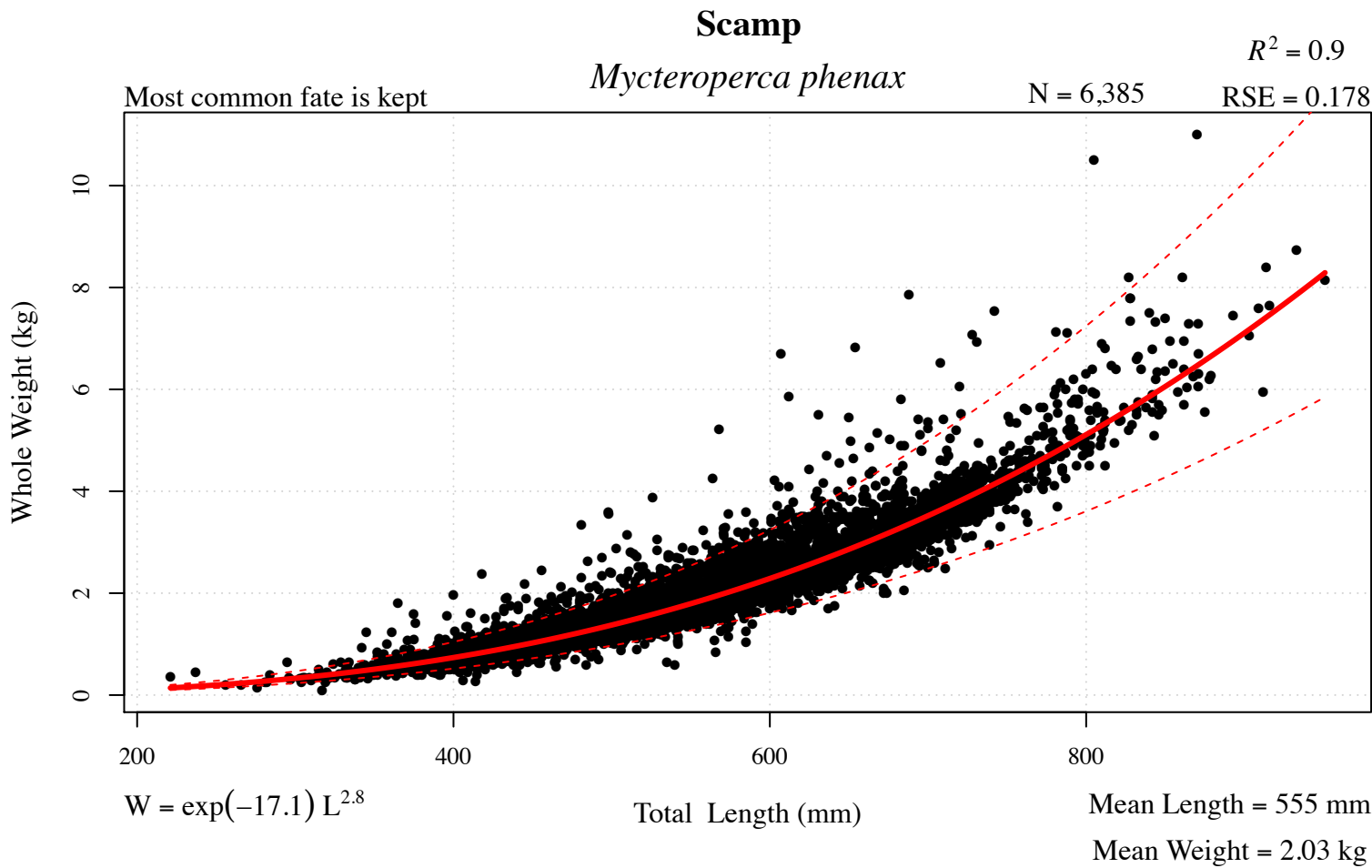


Statistical Zones, N = 51



Depth (Feet)

Figure 6 . Regression model, location, and depth information for grouper, yellowmouth (*Mycteroperca interstitialis*).



More common in the Eastern Gulf

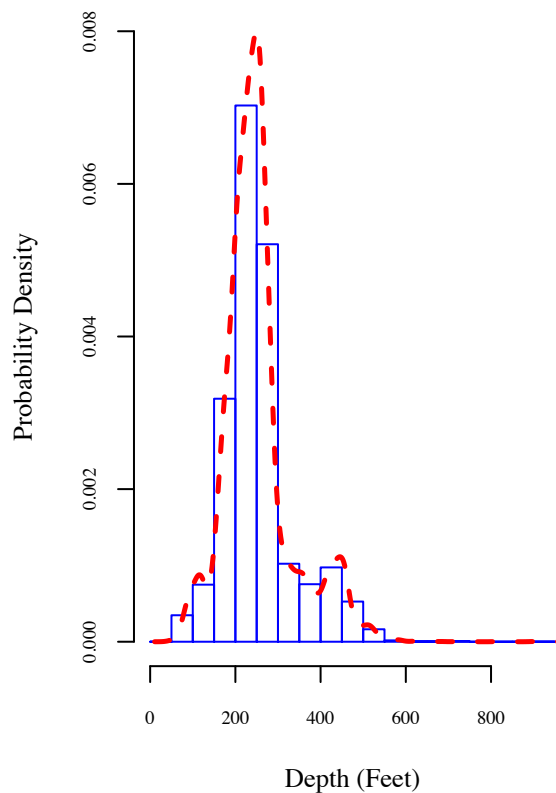
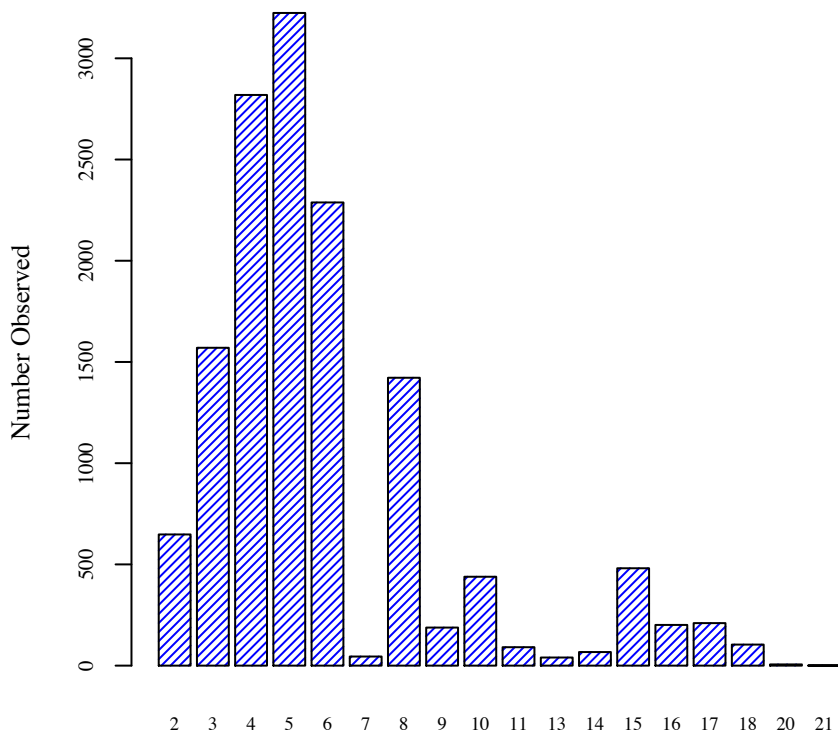
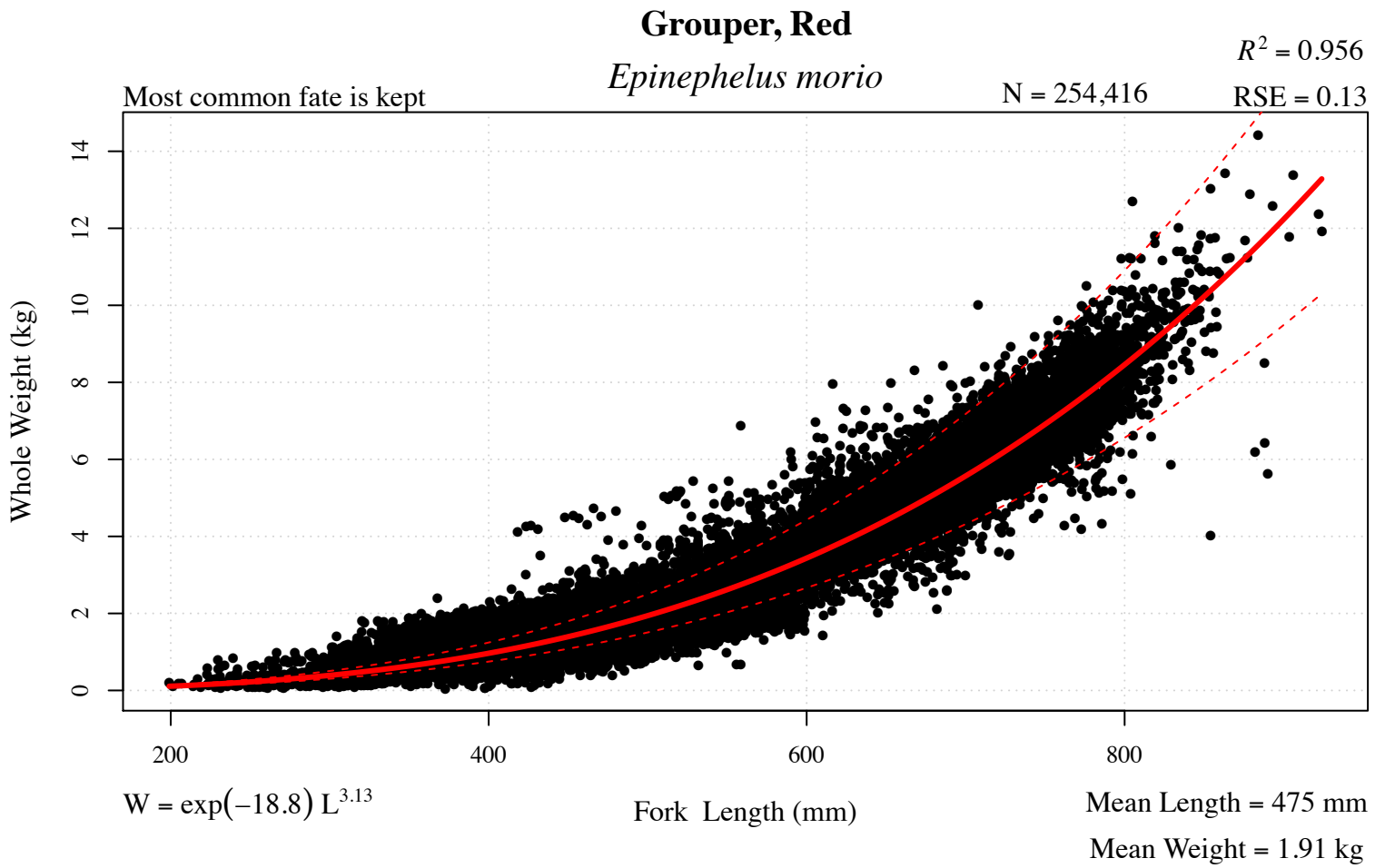


Figure 7 . Regression model, location, and depth information for scamp (*Mycteroperca phenax*).



More common in the Eastern Gulf

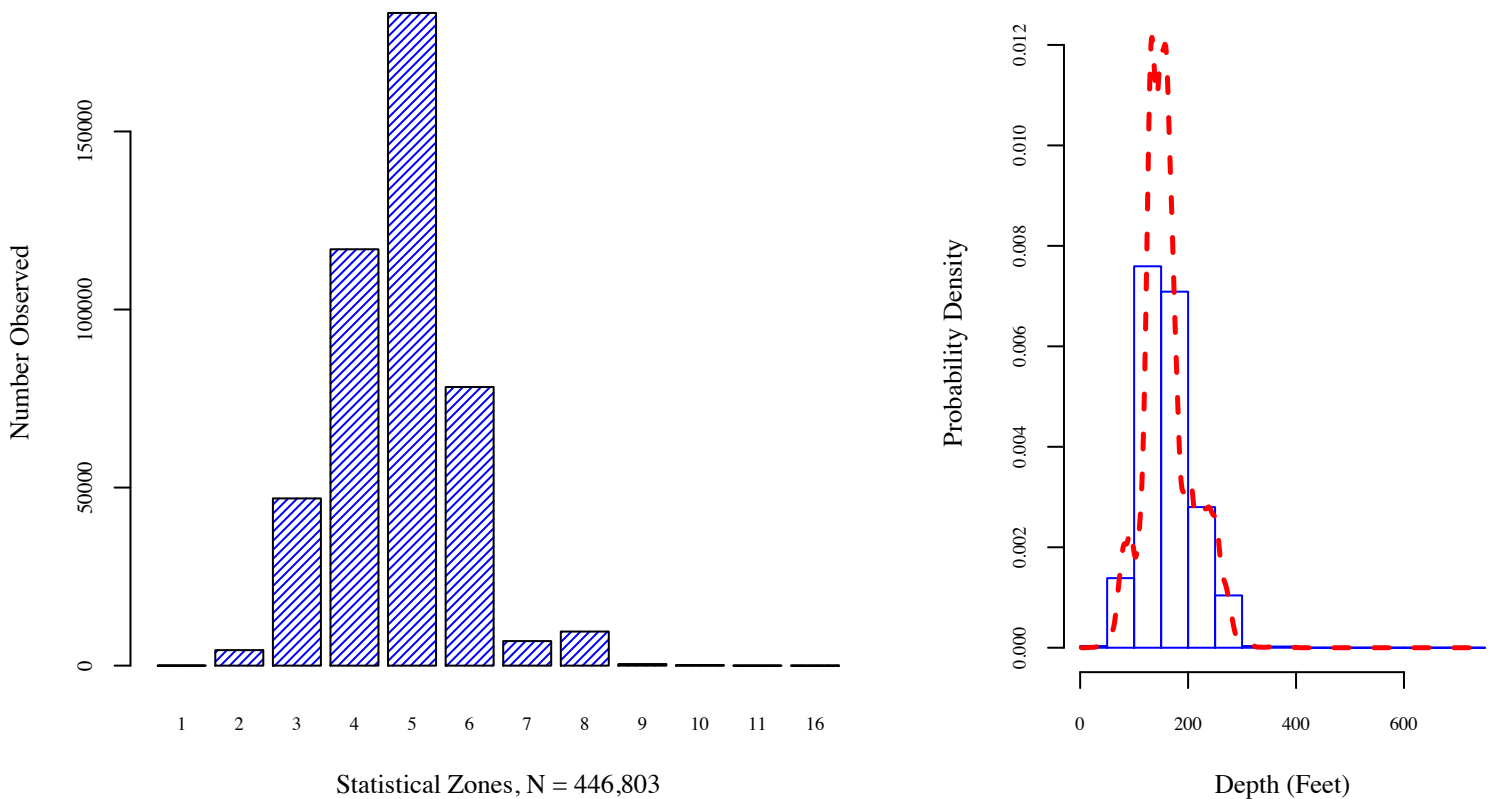
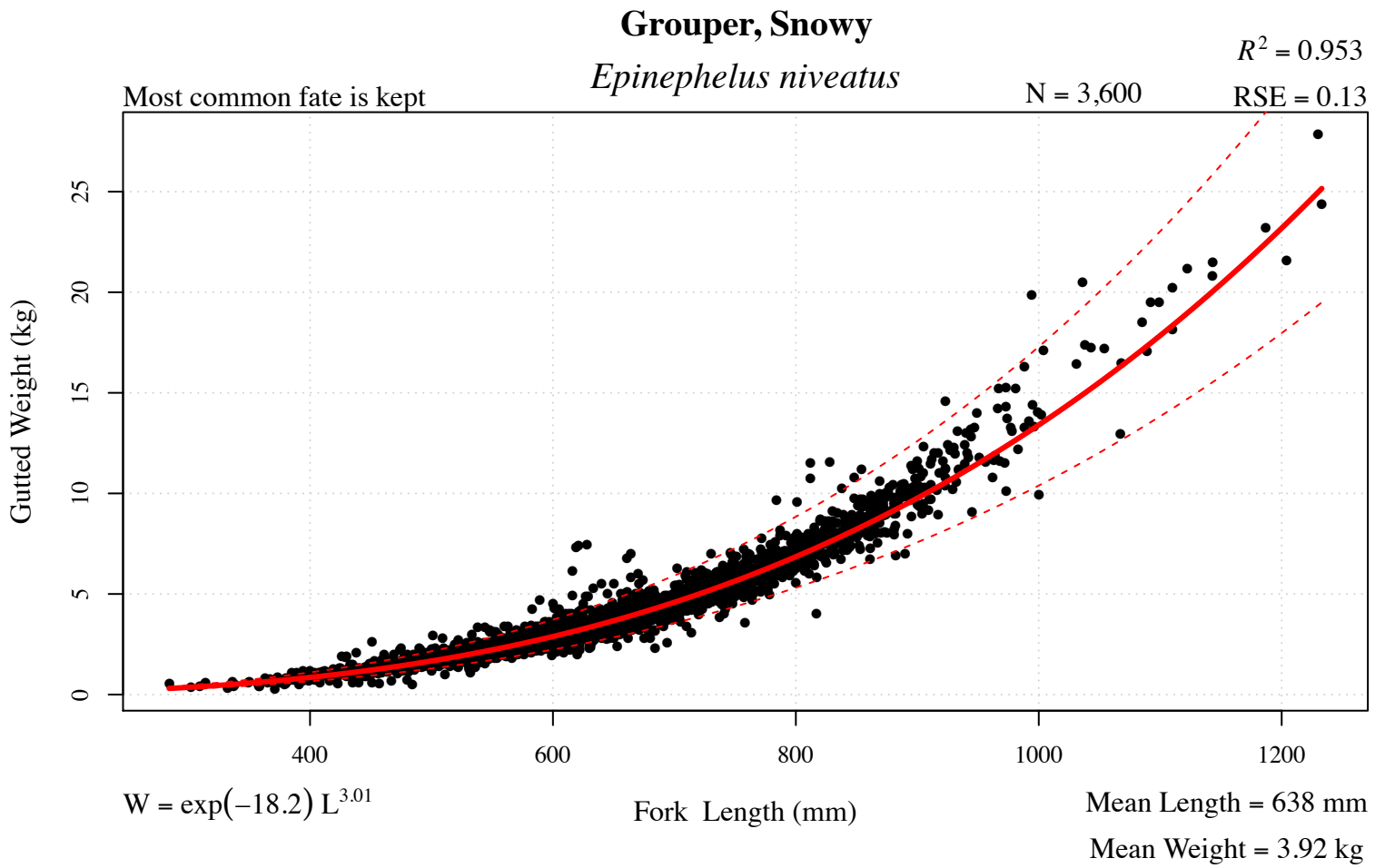


Figure 8 . Regression model, location, and depth information for grouper, red (*Epinephelus morio*).



More common in the Eastern Gulf

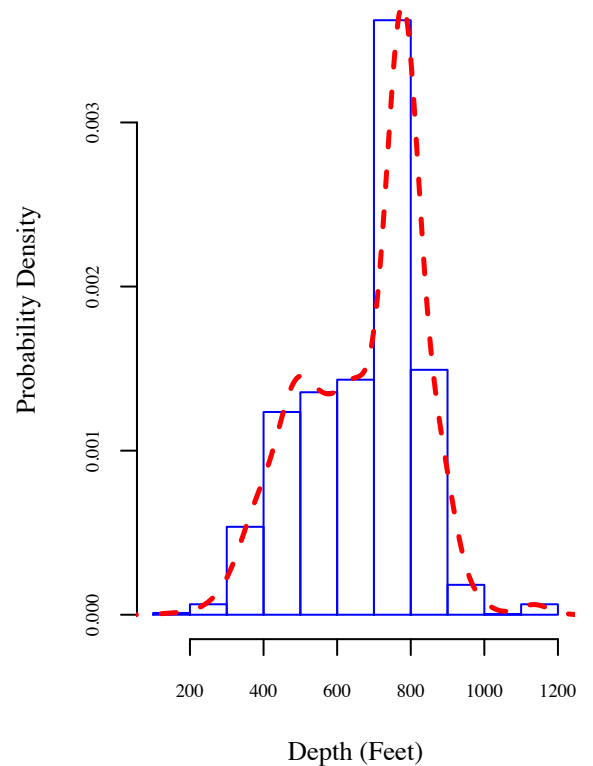
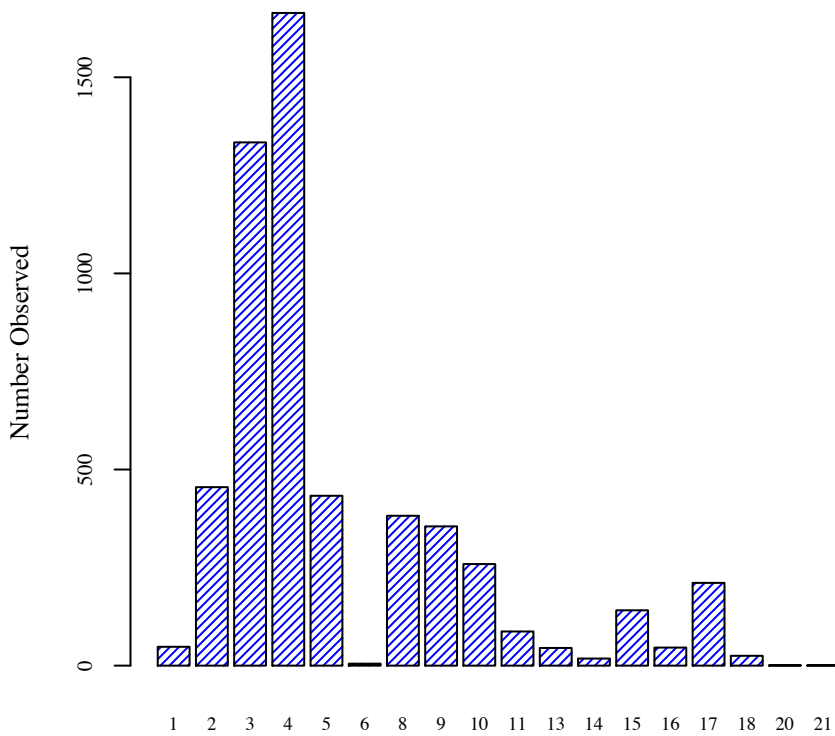
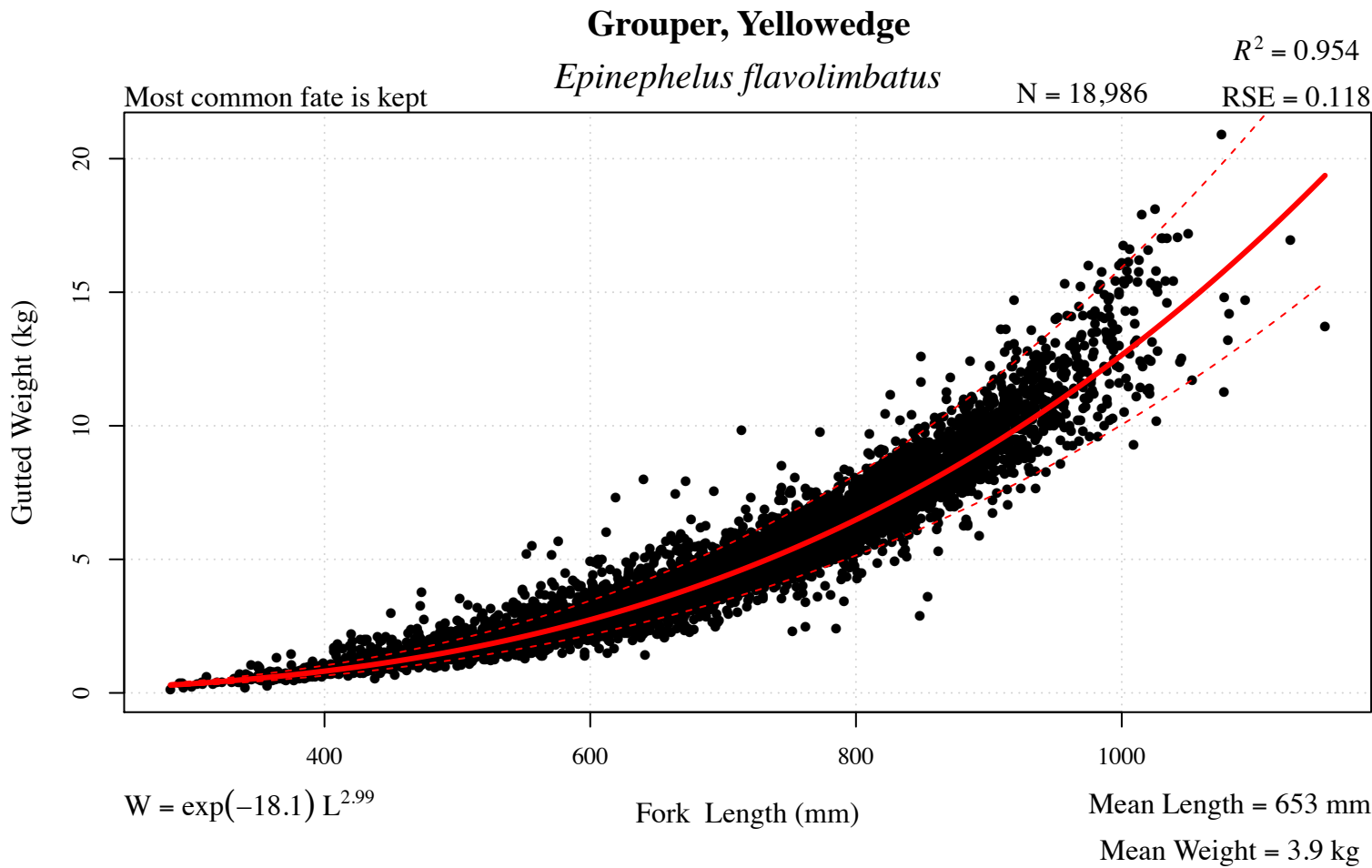


Figure 9 . Regression model, location, and depth information for grouper, snowy (*Epinephelus niveatus*).



More common in the Eastern Gulf

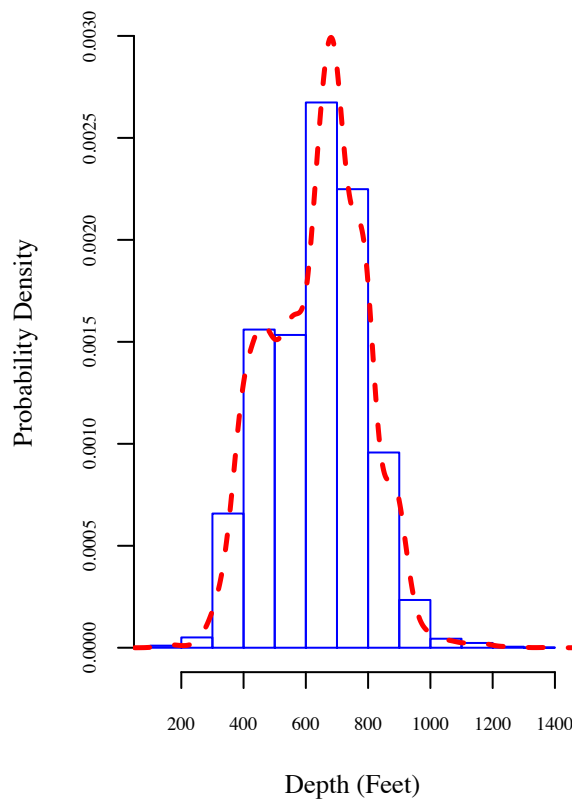
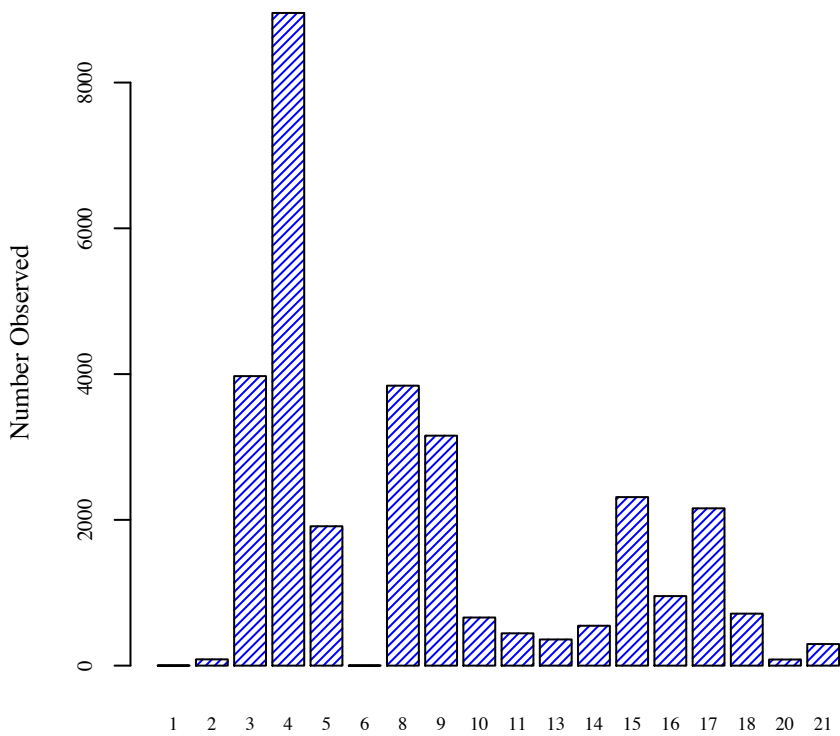


Figure 10 . Regression model, location, and depth information for grouper, yellowedge (*Epinephelus flavolimbatus*).

Grouper, Marbled

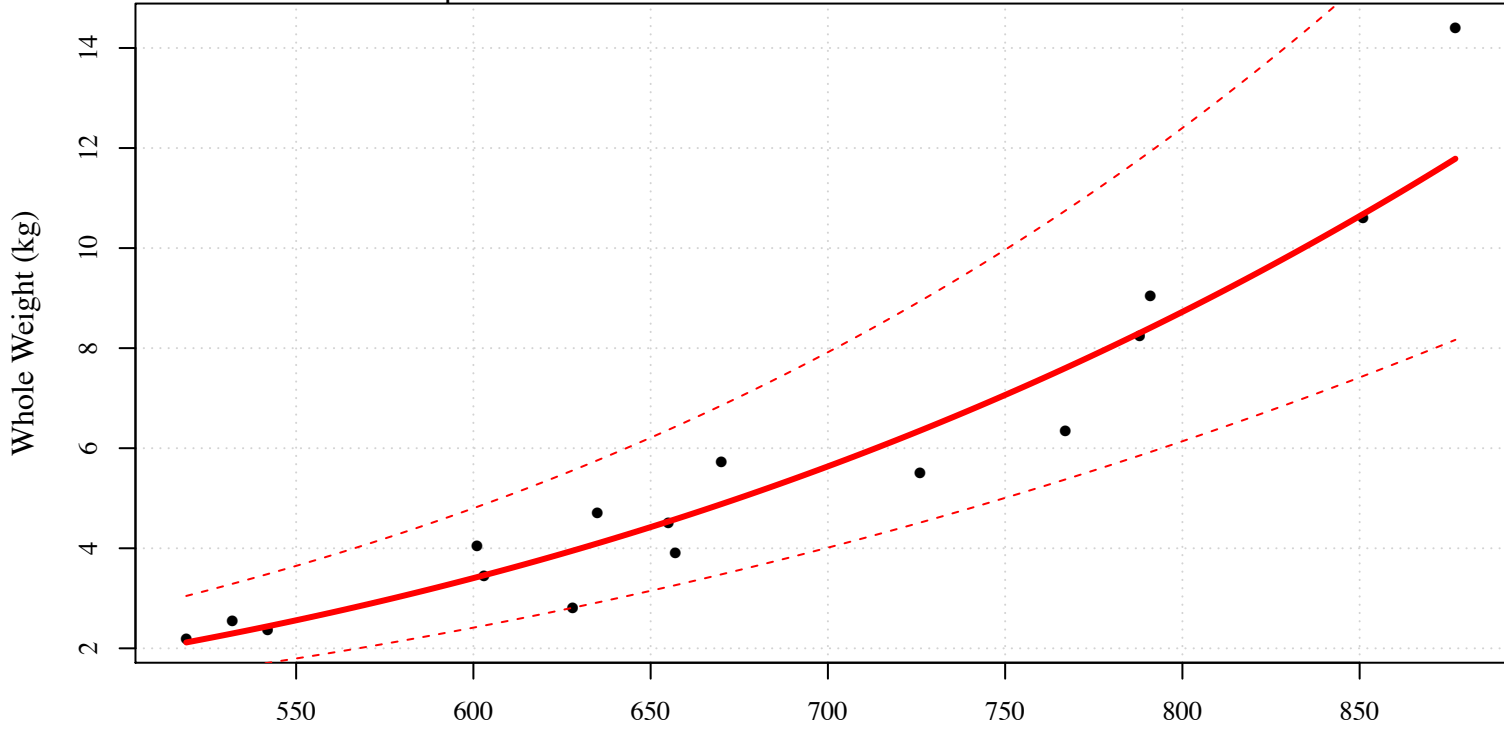
Epinephelus inermis

$R^2 = 0.924$

N = 16

RSE = 0.153

Most common fate is kept



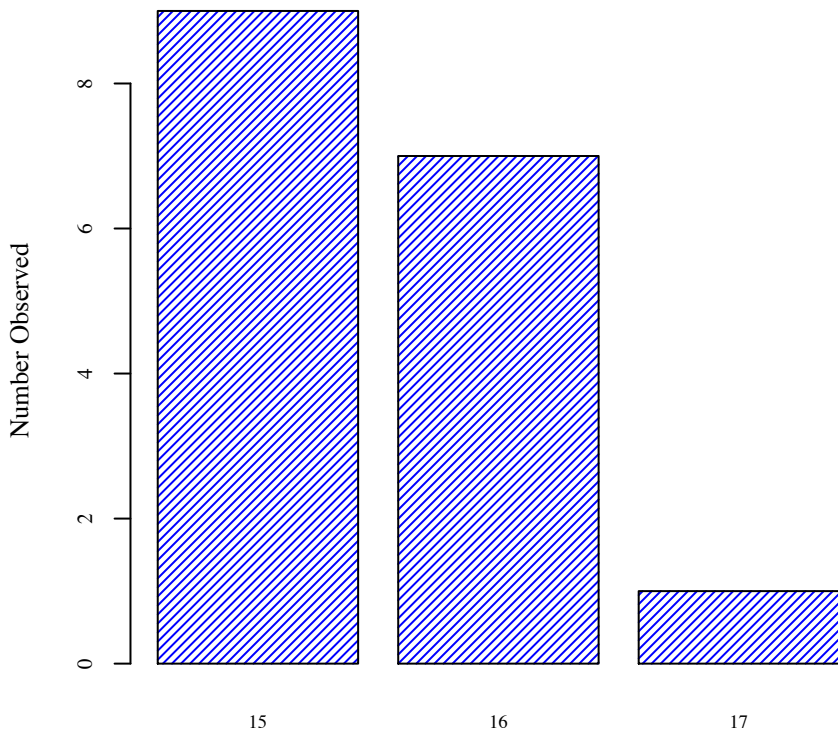
$$W = \exp(-19.7) L^{3.27}$$

Fork Length (mm)

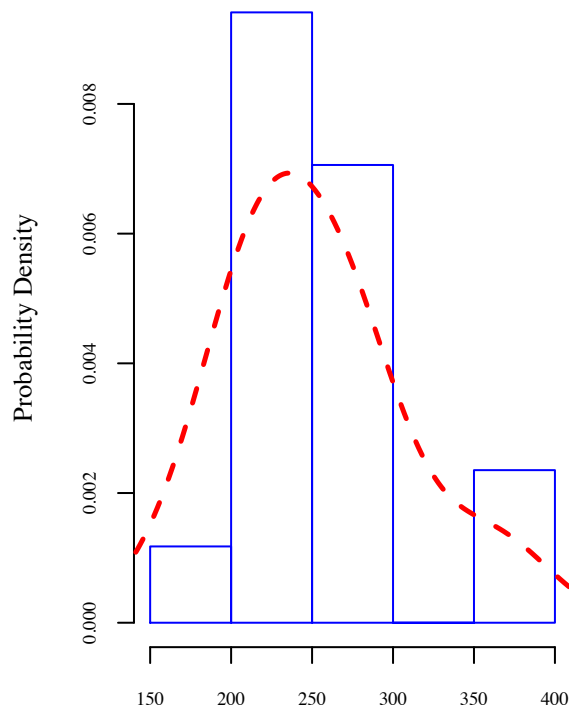
Mean Length = 678 mm

Mean Weight = 5.65 kg

More common in the Western Gulf

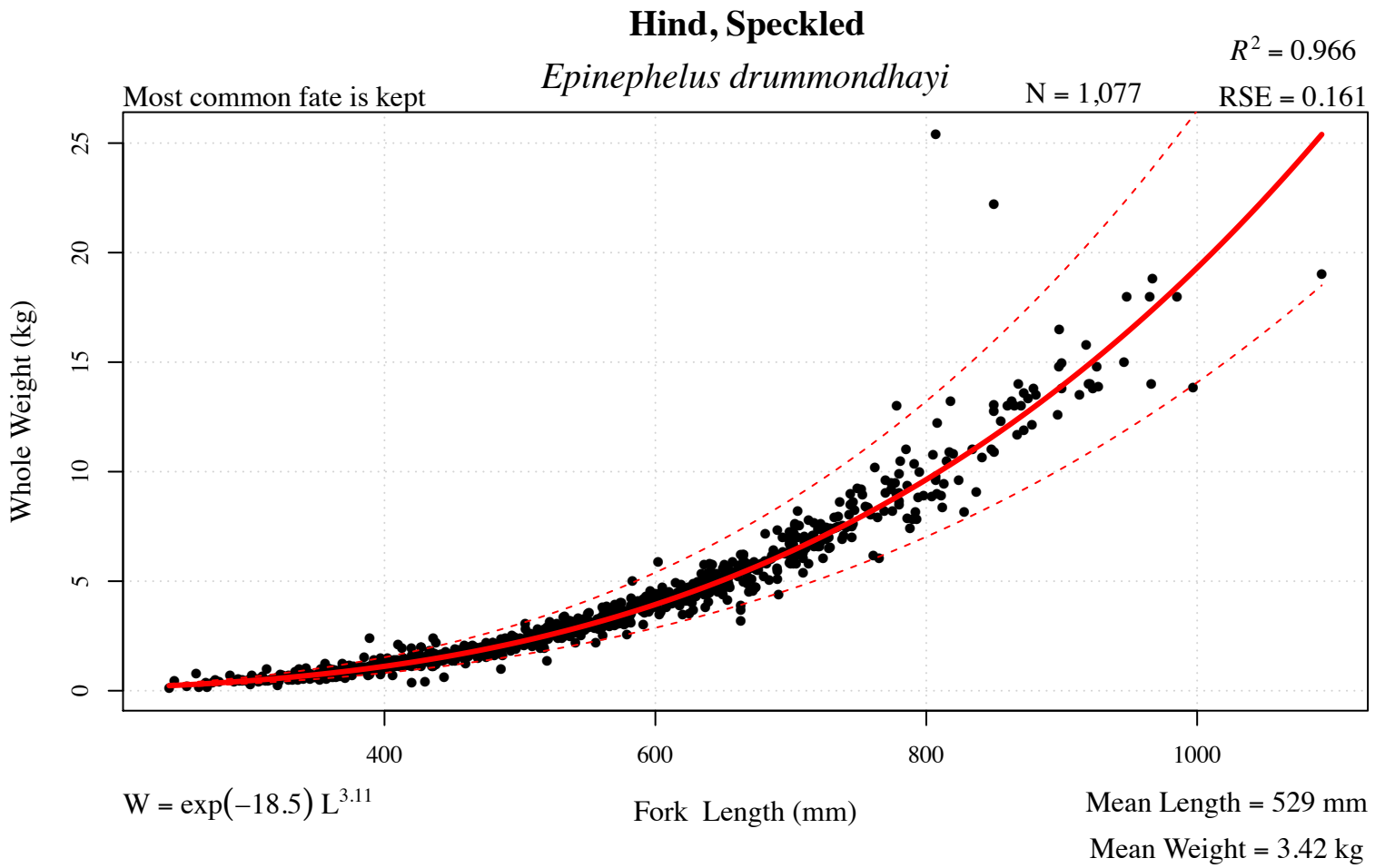


Statistical Zones, N = 17



Depth (Feet)

Figure 11 . Regression model, location, and depth information for grouper, marbled (*Epinephelus inermis*).



More common in the Eastern Gulf

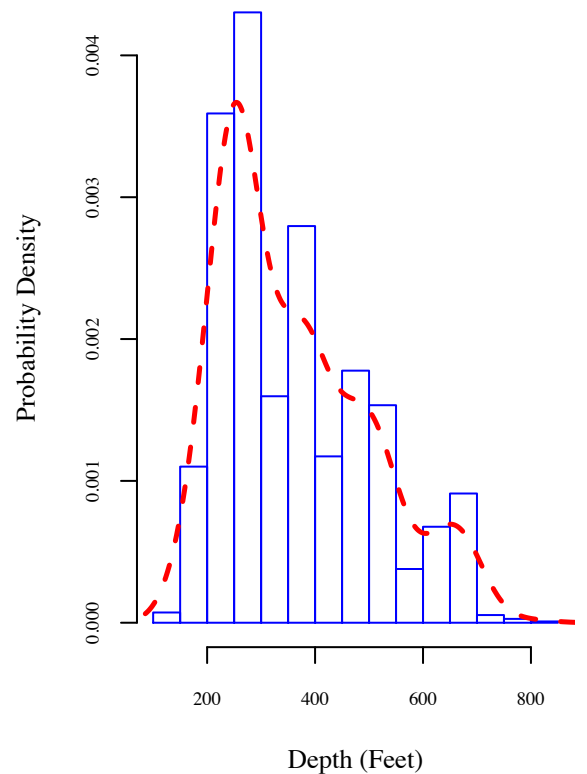
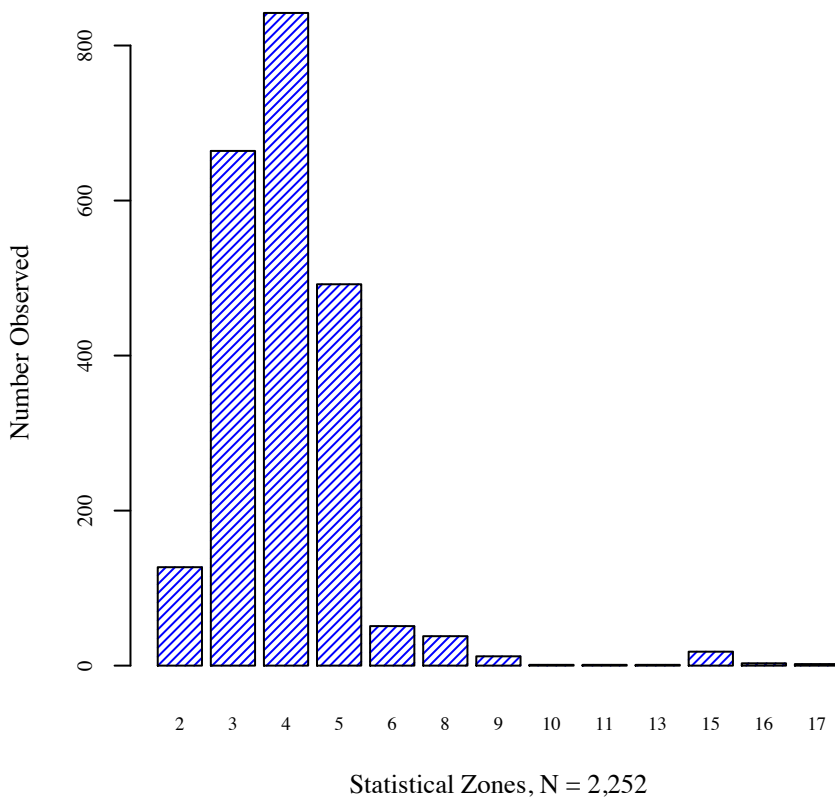
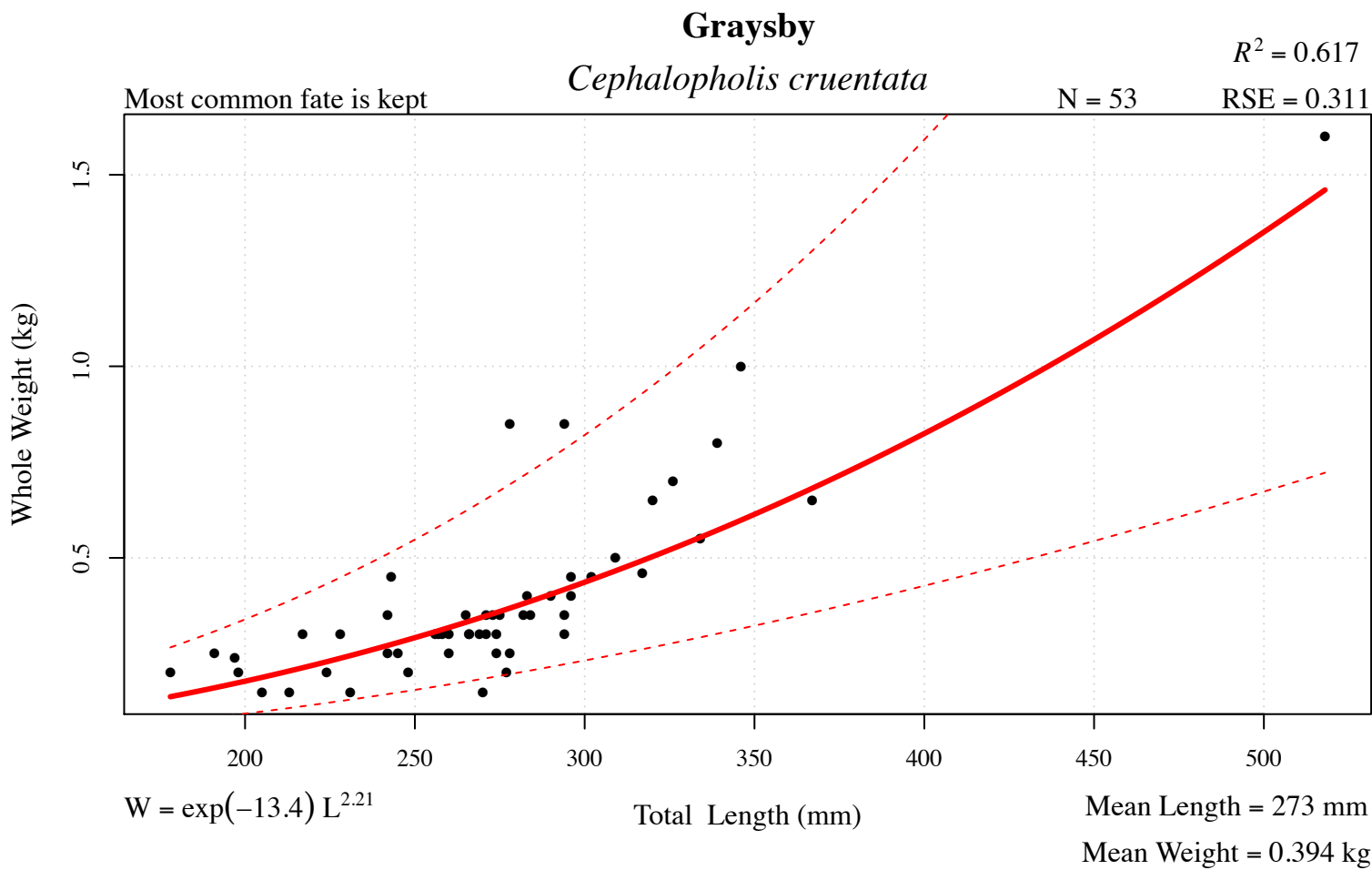
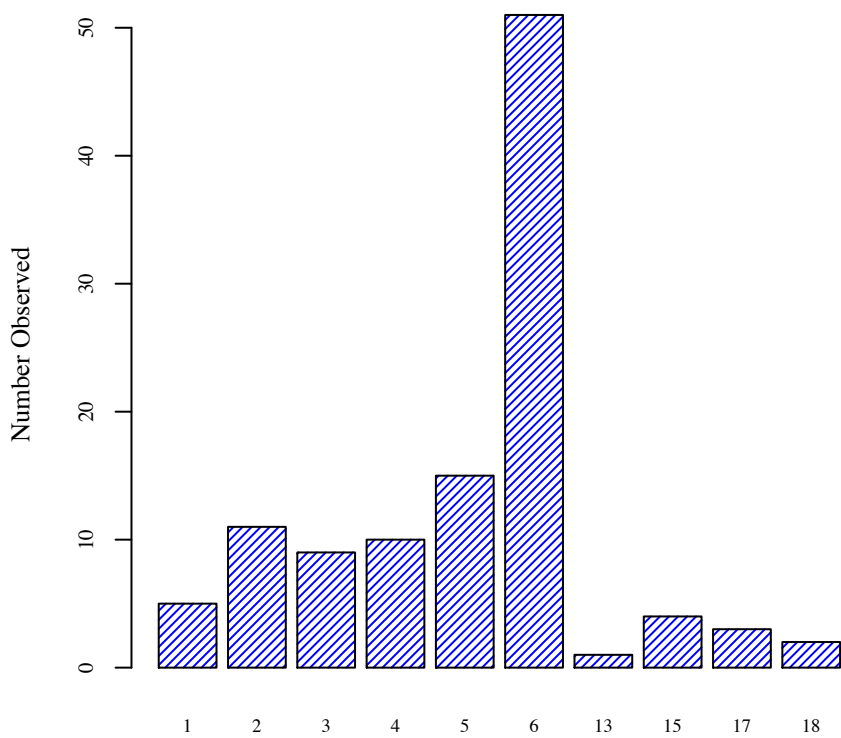


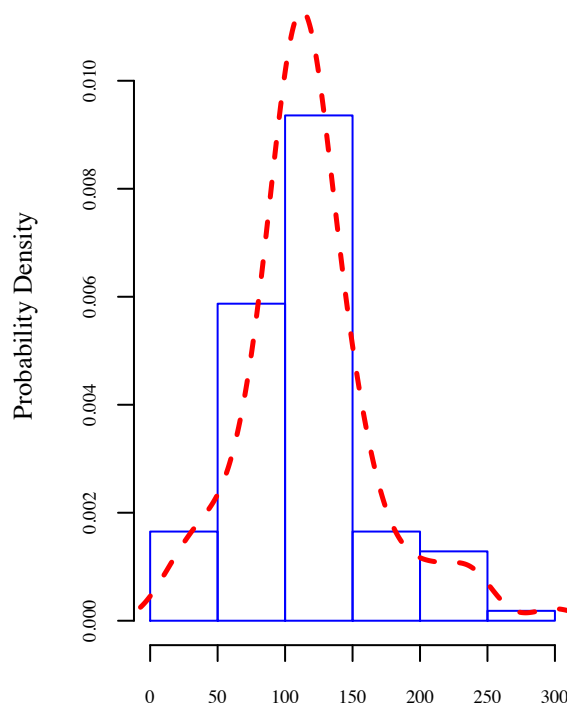
Figure 12 . Regression model, location, and depth information for hind, speckled (*Epinephelus drummondhayi*).



More common in the Eastern Gulf



Statistical Zones, N = 111



Depth (Feet)

Figure 13 . Regression model, location, and depth information for graysby (*Cephalopholis cruentata*).

Hind, Red (Strawberry Grouper)

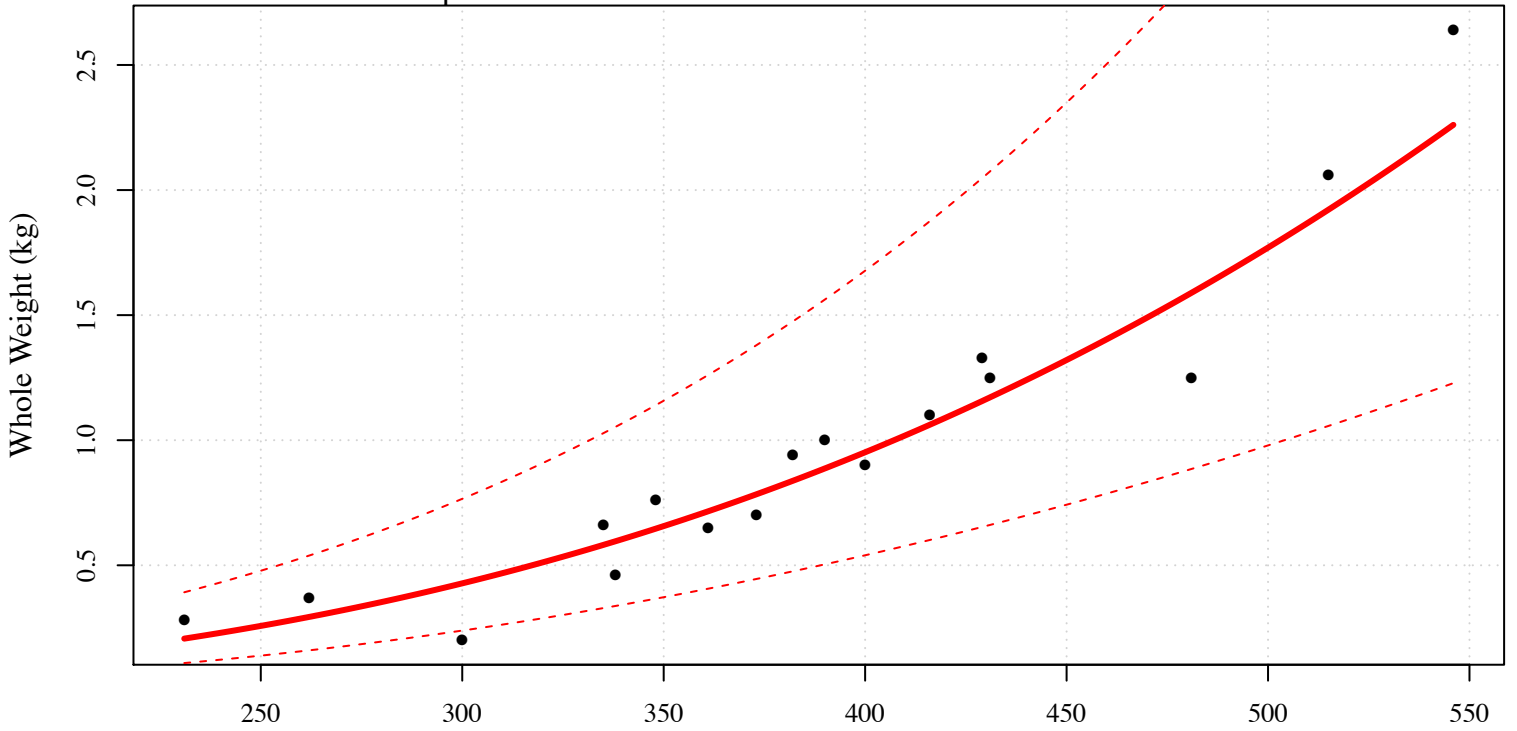
Epinephelus guttatus

$R^2 = 0.852$

RSE = 0.258

Most common fate is kept

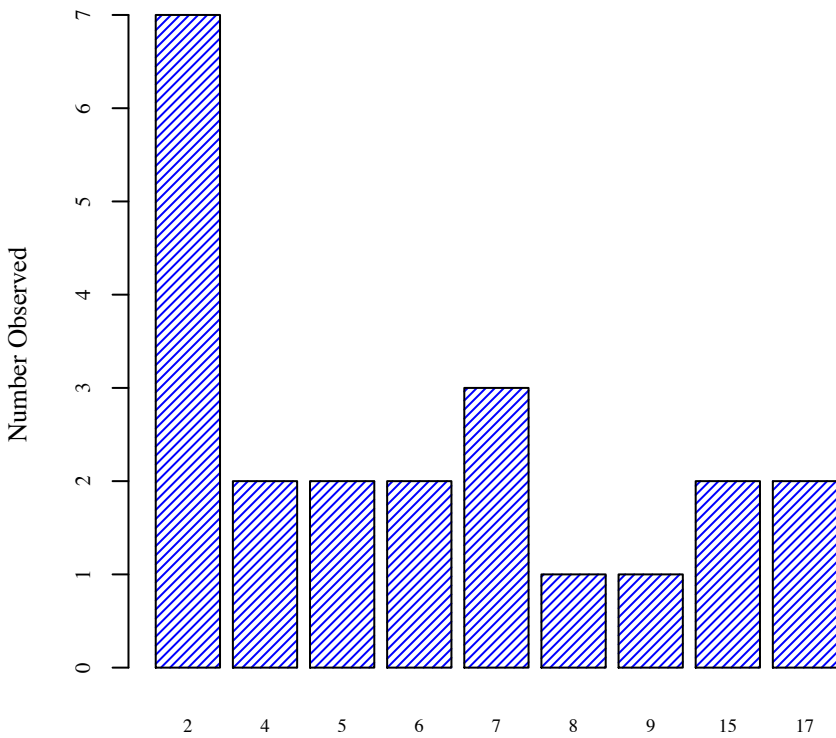
N = 17



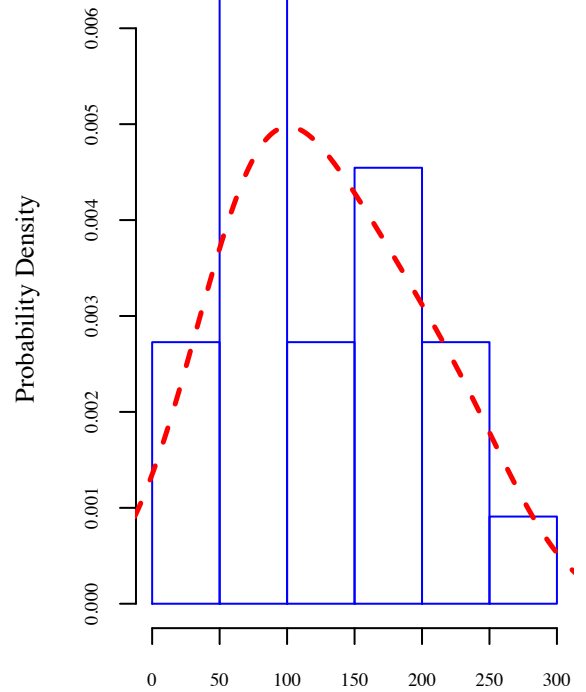
Mean Length = 385 mm

Mean Weight = 0.974 kg

More common in the Eastern Gulf

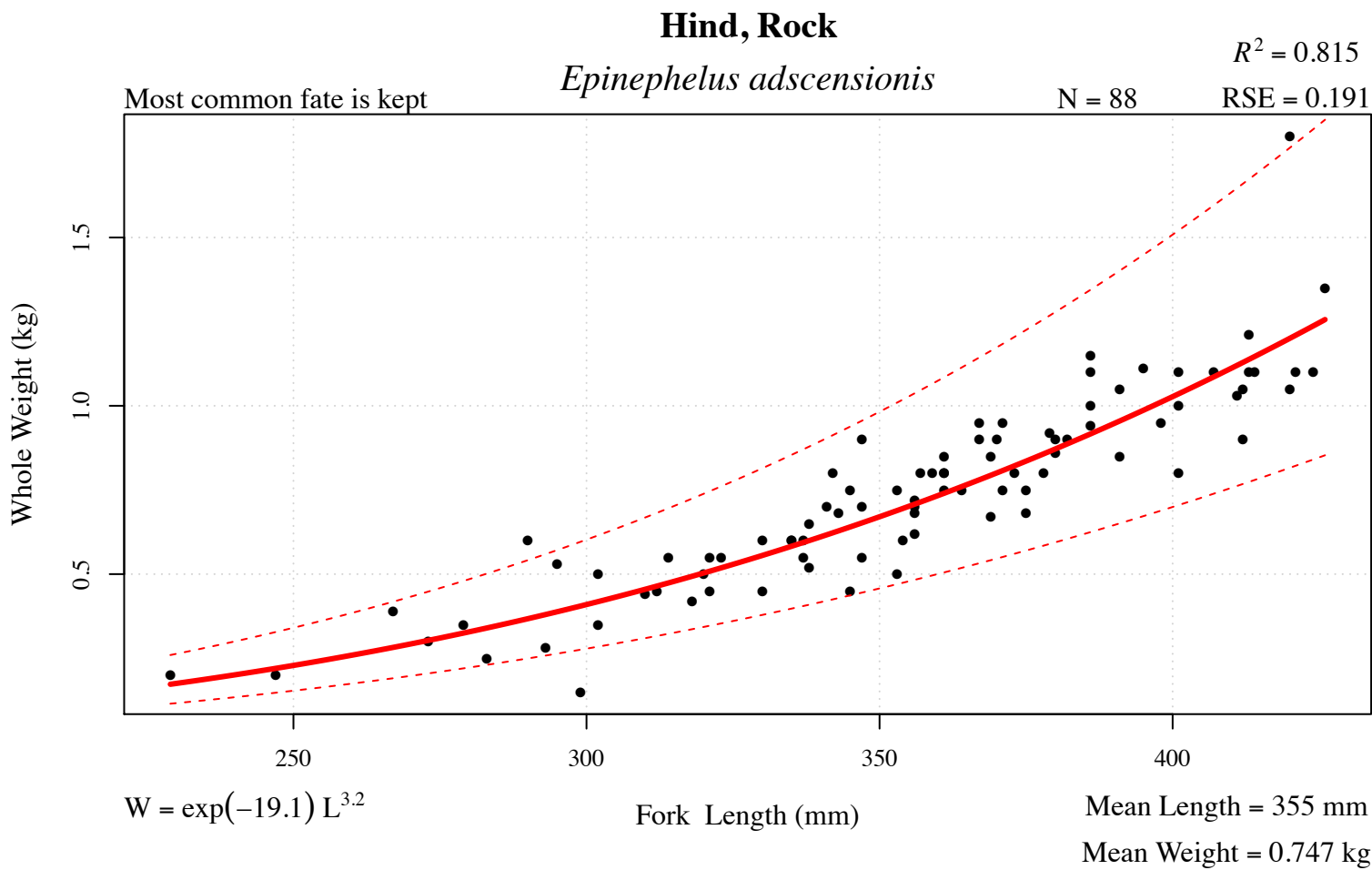


Statistical Zones, N = 22



Depth (Feet)

Figure 14 . Regression model, location, and depth information for hind, red (strawberry grouper) (*Epinephelus guttatus*).



More common in the Eastern Gulf

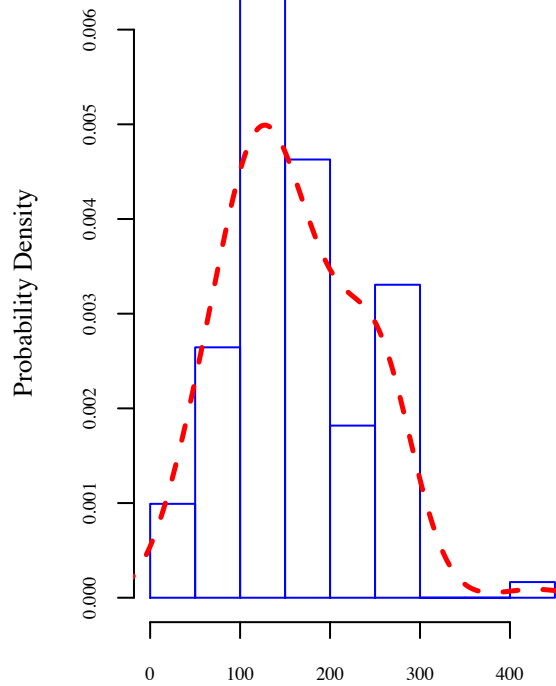
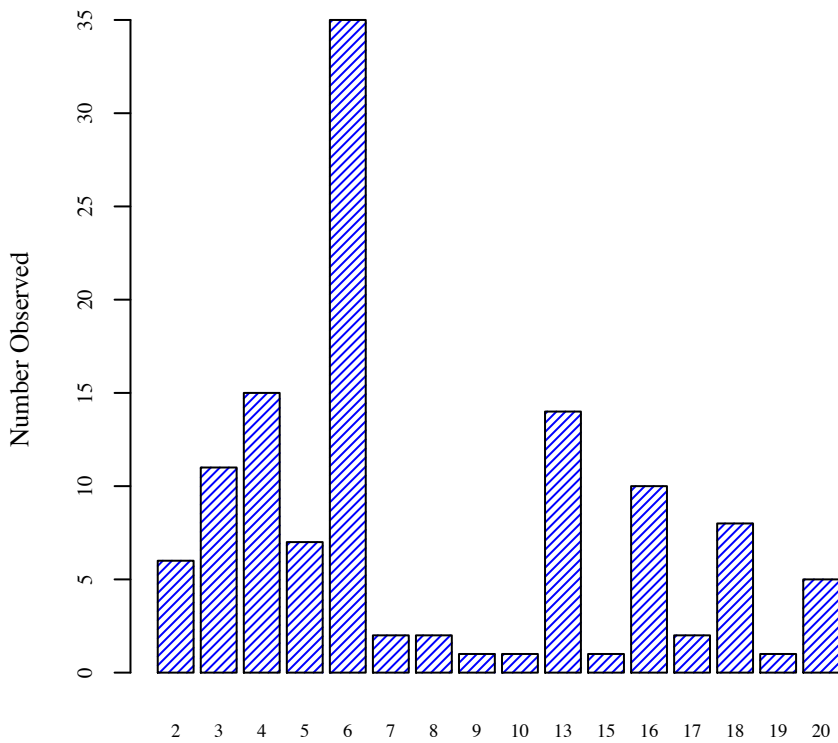
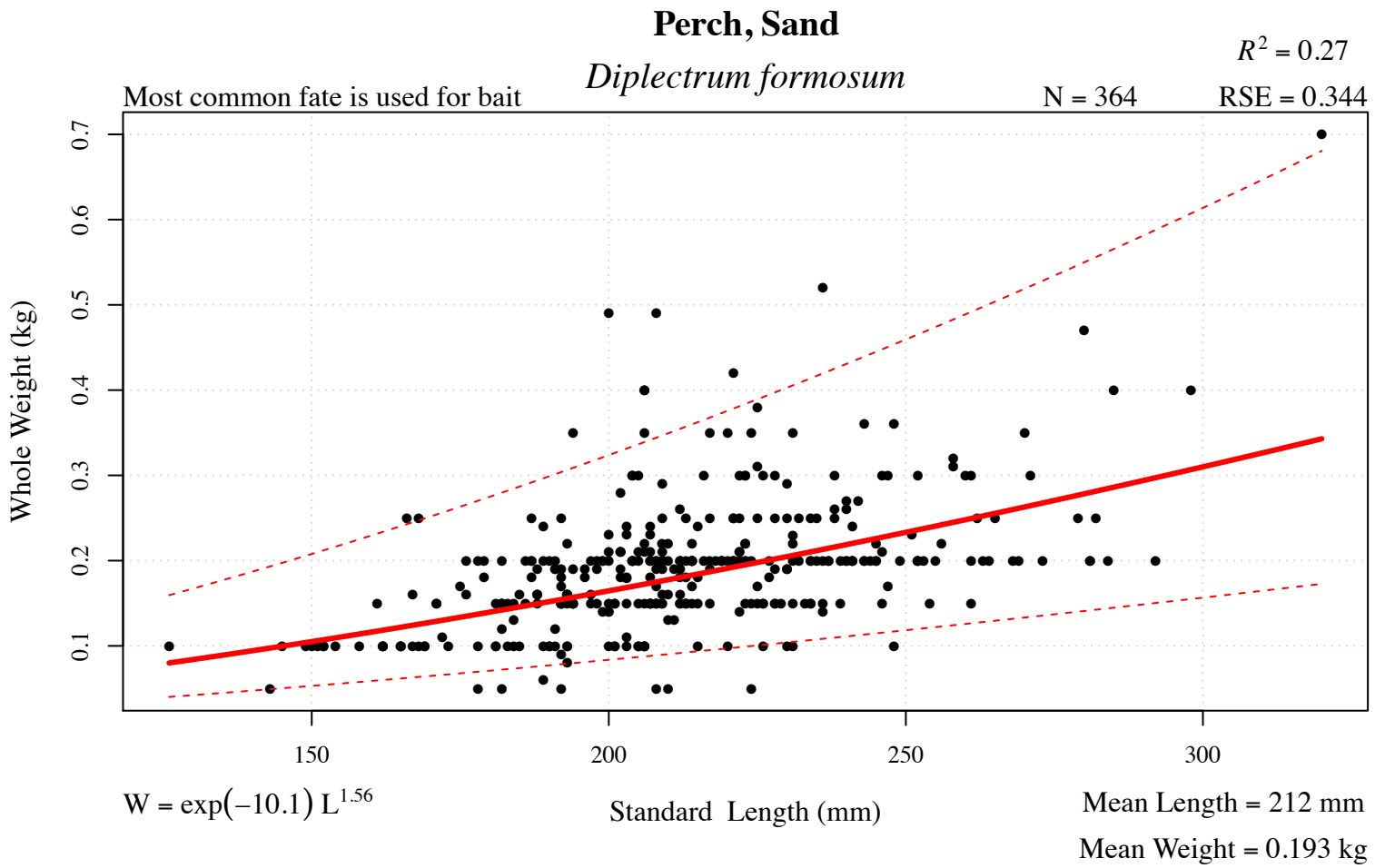


Figure 15 . Regression model, location, and depth information for hind, rock (*Epinephelus adscensionis*).



More common in the Eastern Gulf

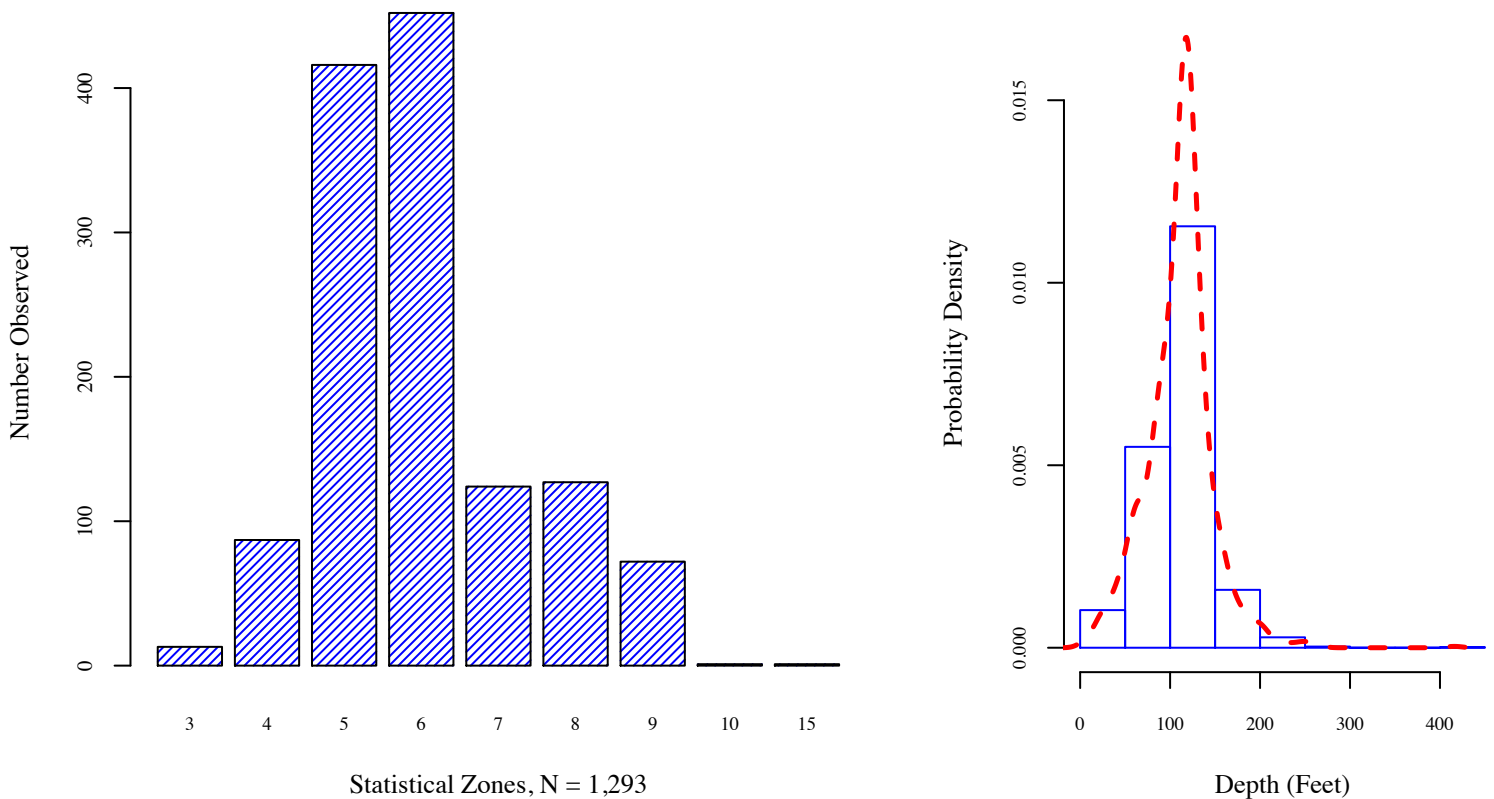
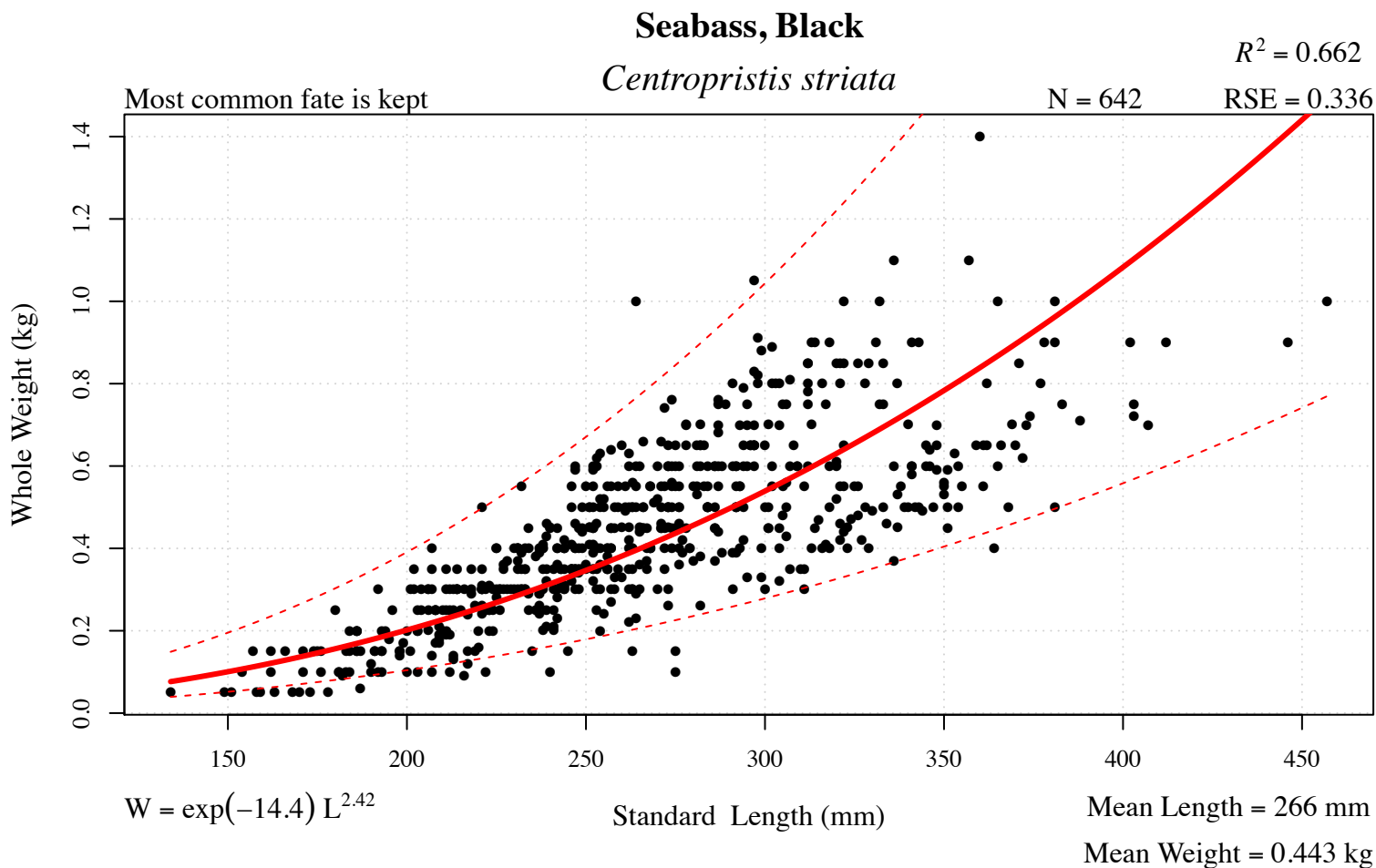


Figure 16 . Regression model, location, and depth information for perch, sand (*Diplectrum formosum*).



More common in the Eastern Gulf

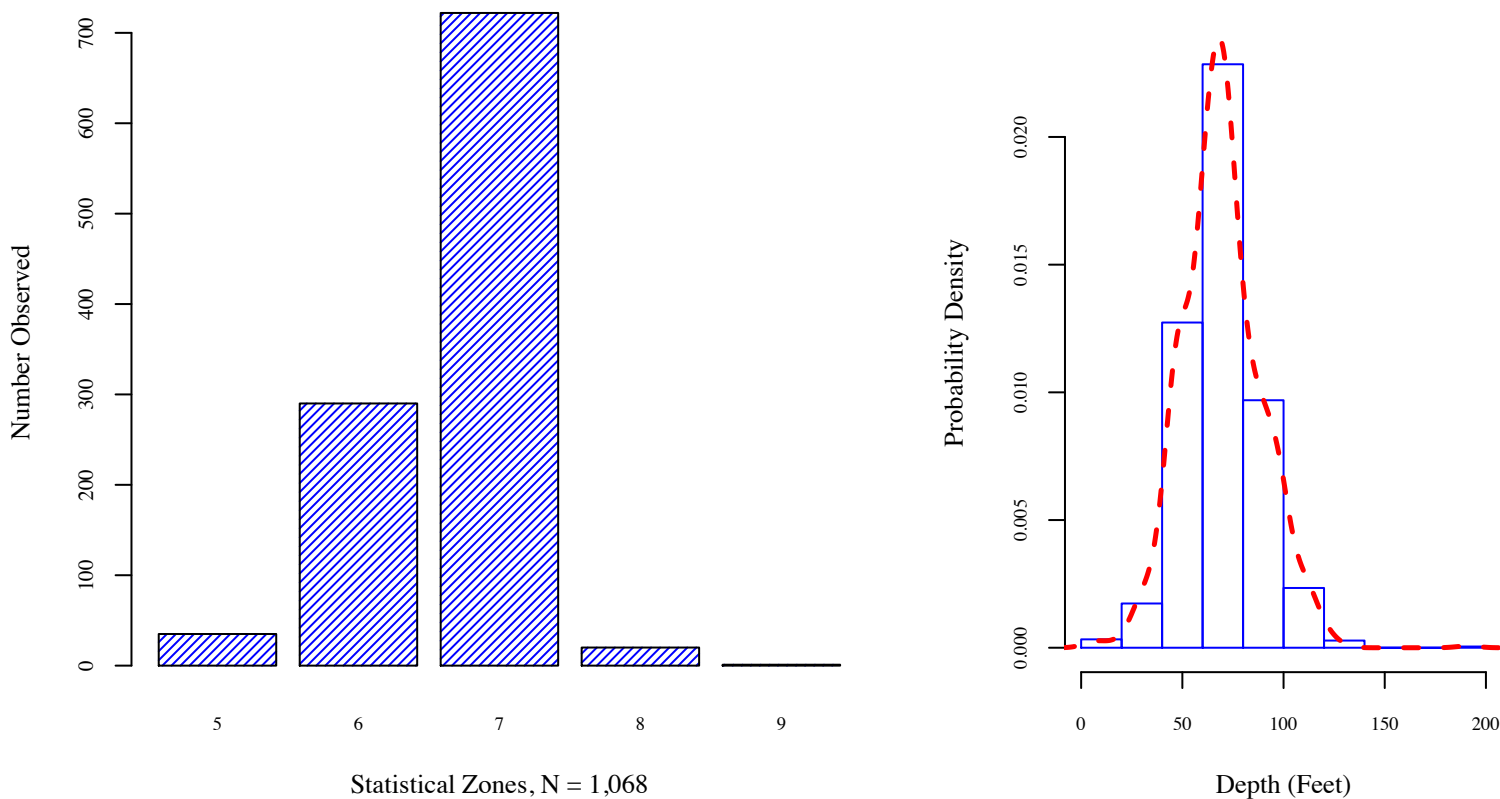
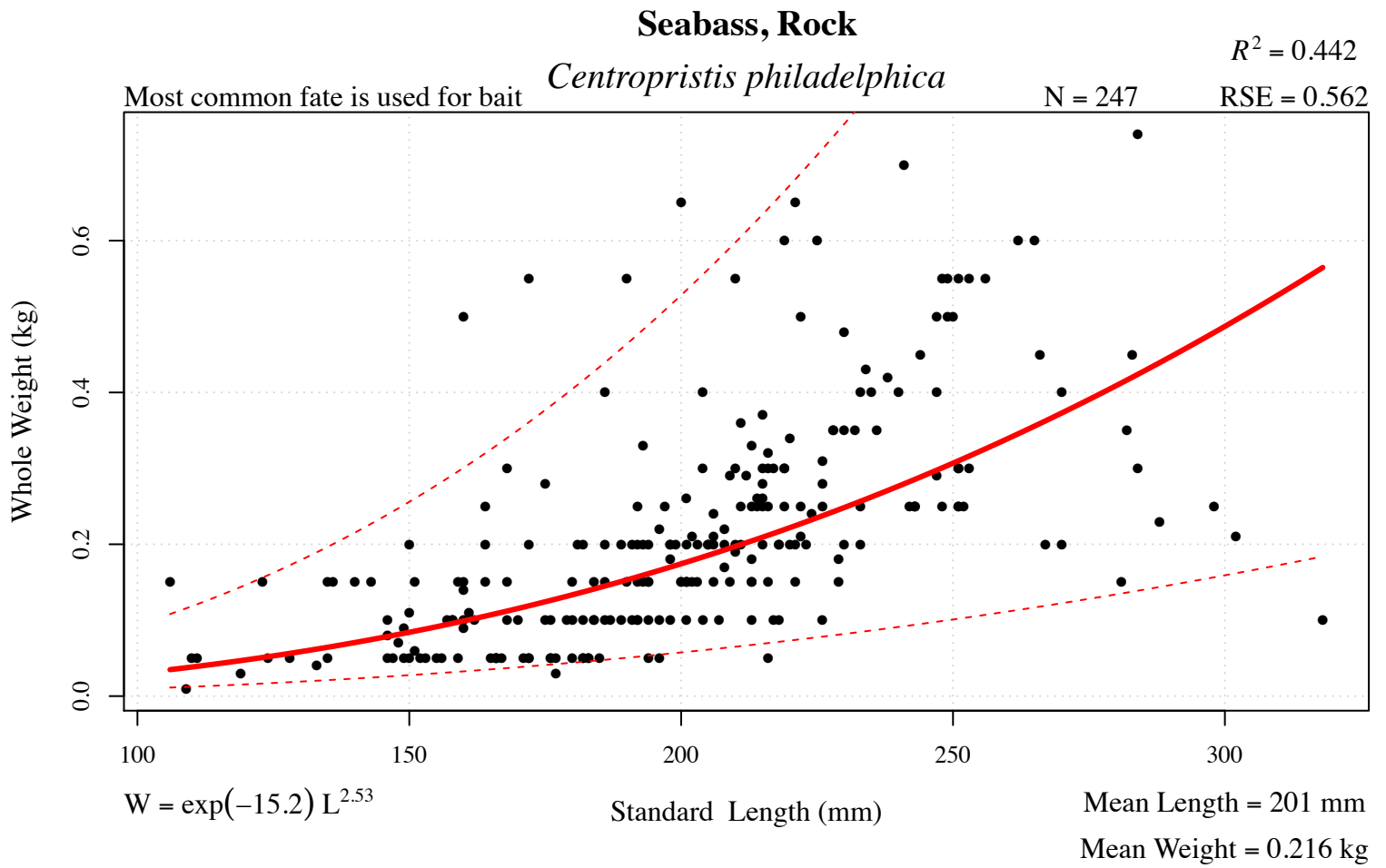


Figure 17 . Regression model, location, and depth information for seabass, black (*Centropristis striata*).



More common in the Eastern Gulf

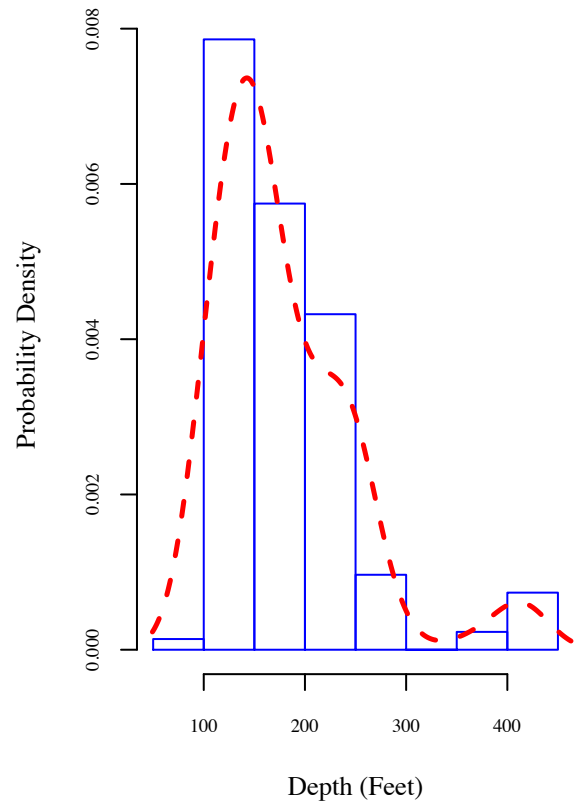
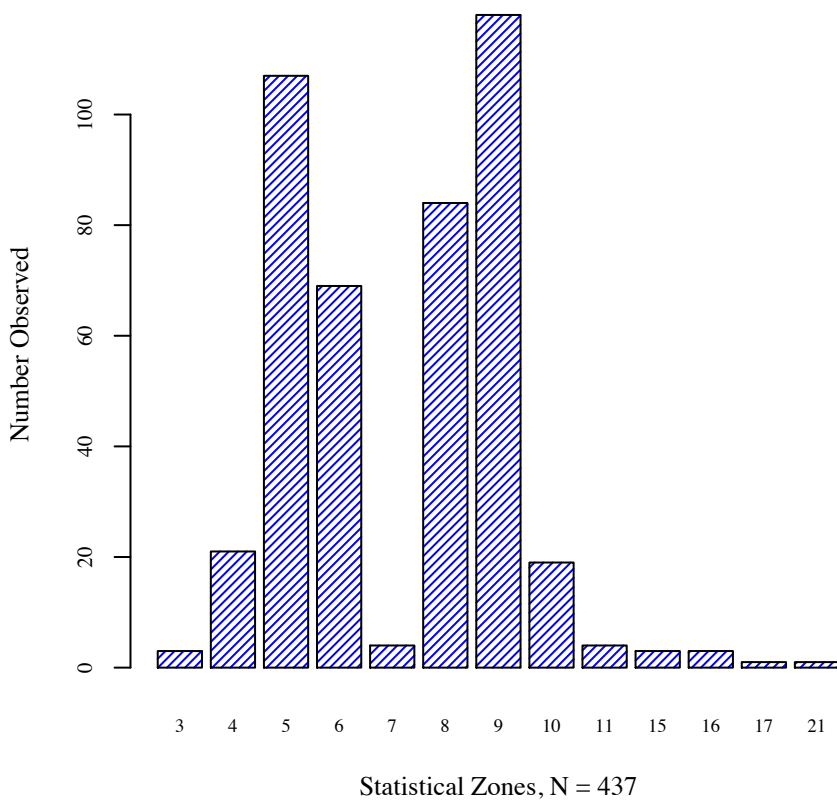
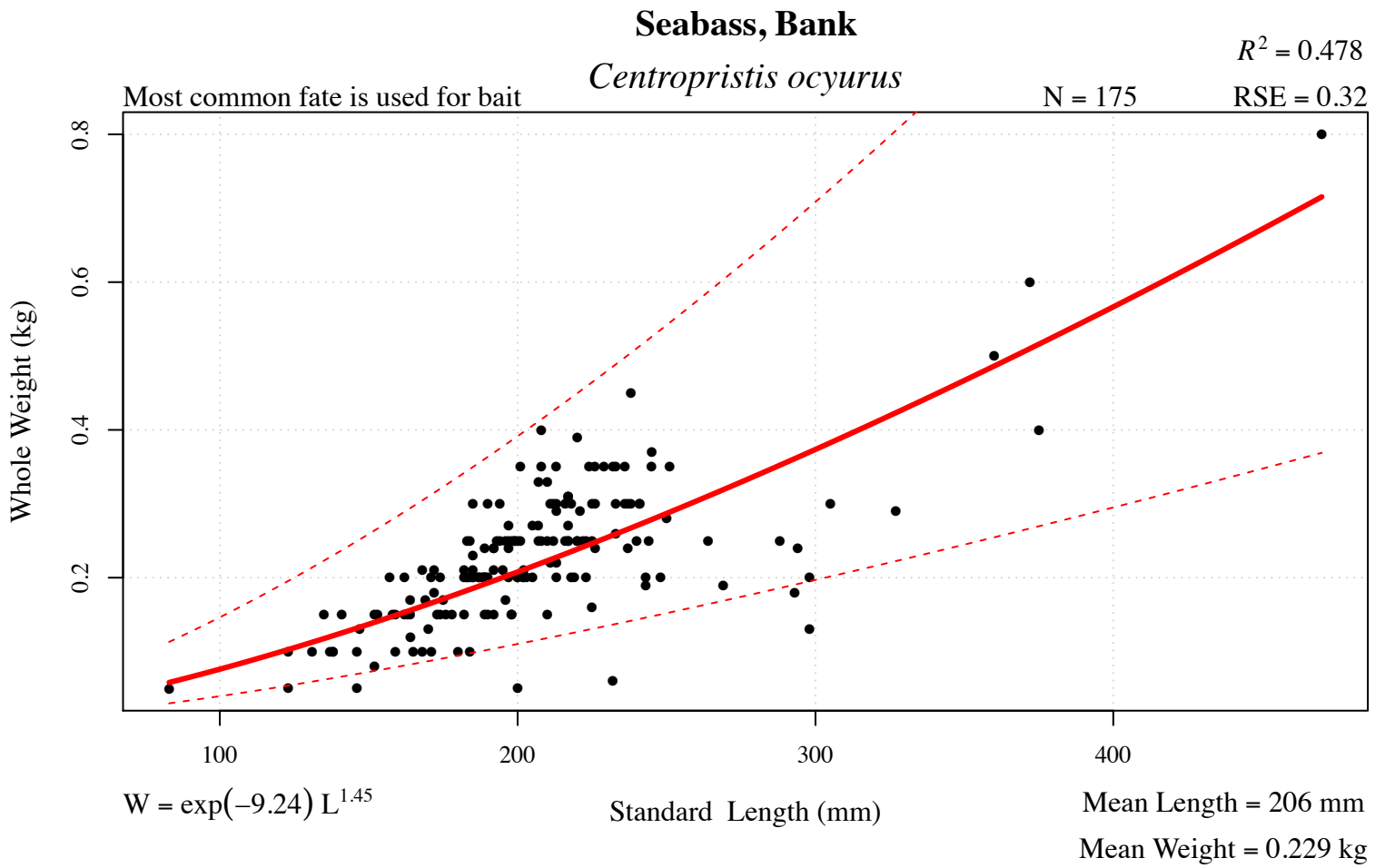


Figure 18 . Regression model, location, and depth information for seabass, rock (*Centropristis philadelphica*).



More common in the Eastern Gulf

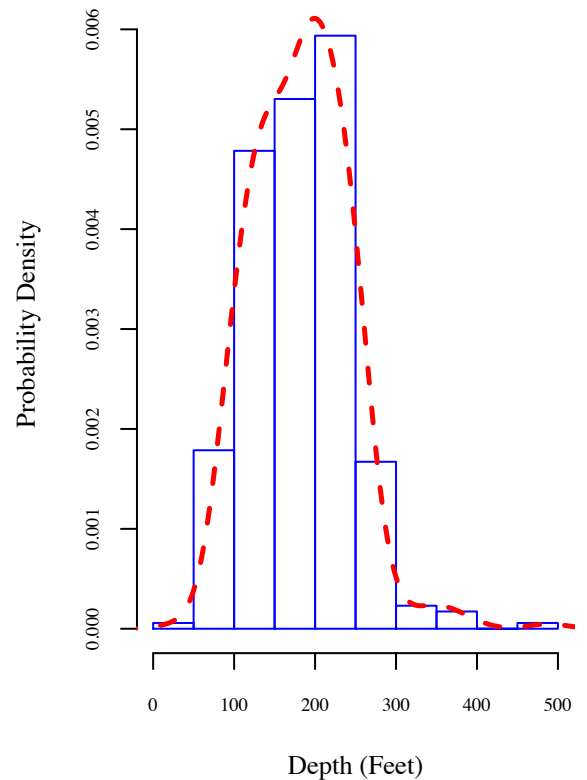
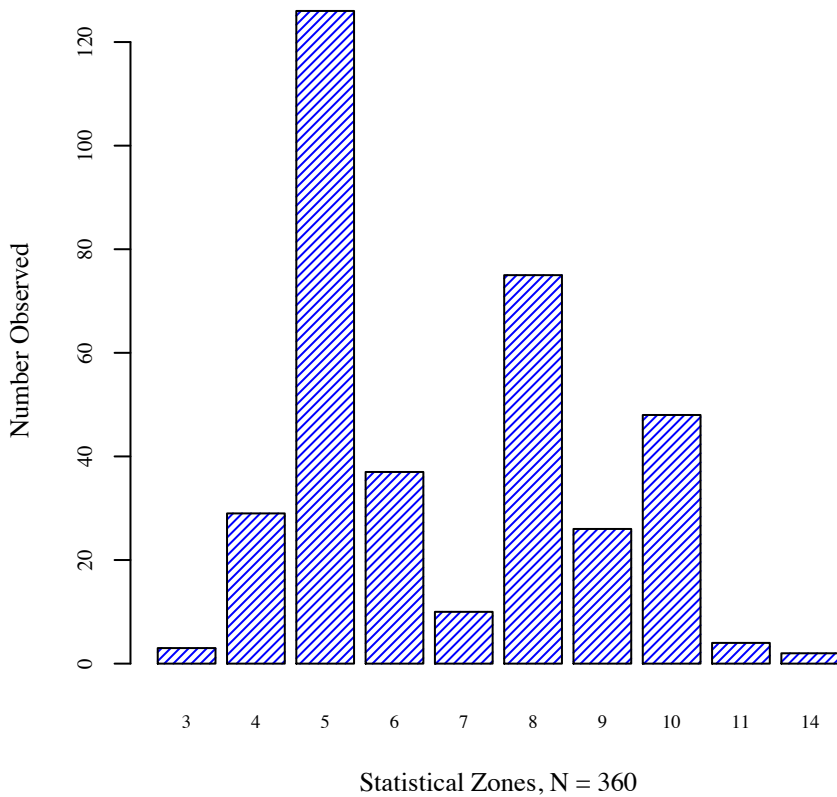
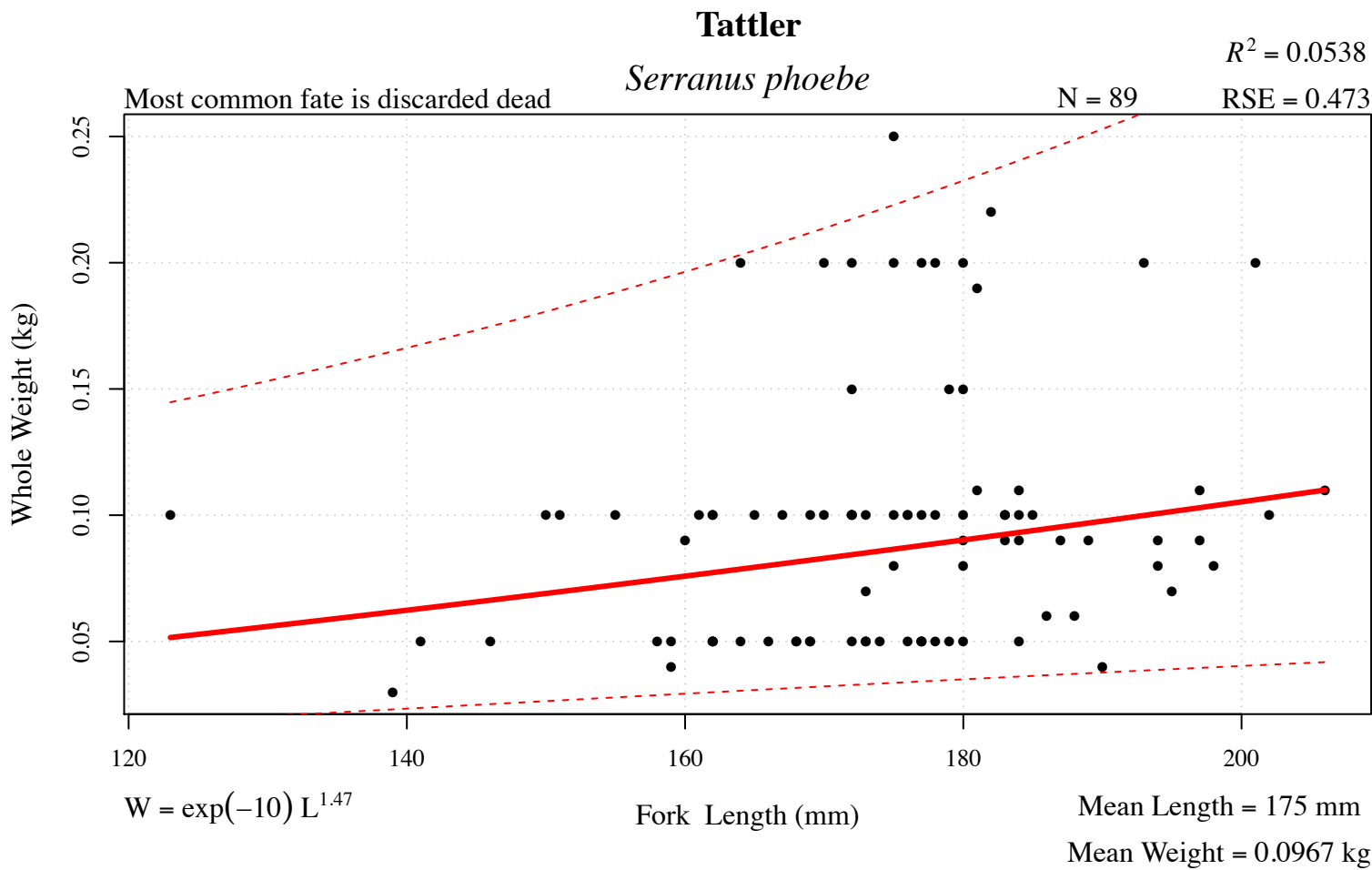


Figure 19 . Regression model, location, and depth information for seabass, bank (*Centropristis ocyurus*).



More common in the Eastern Gulf

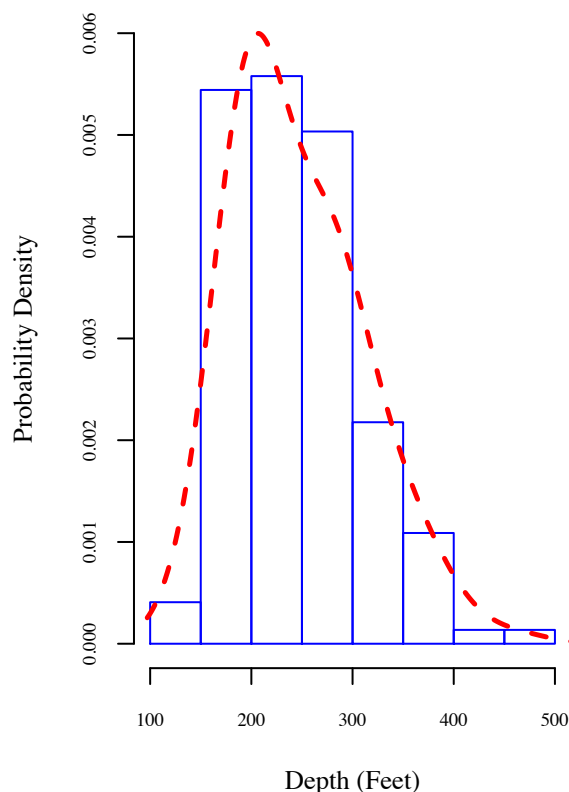
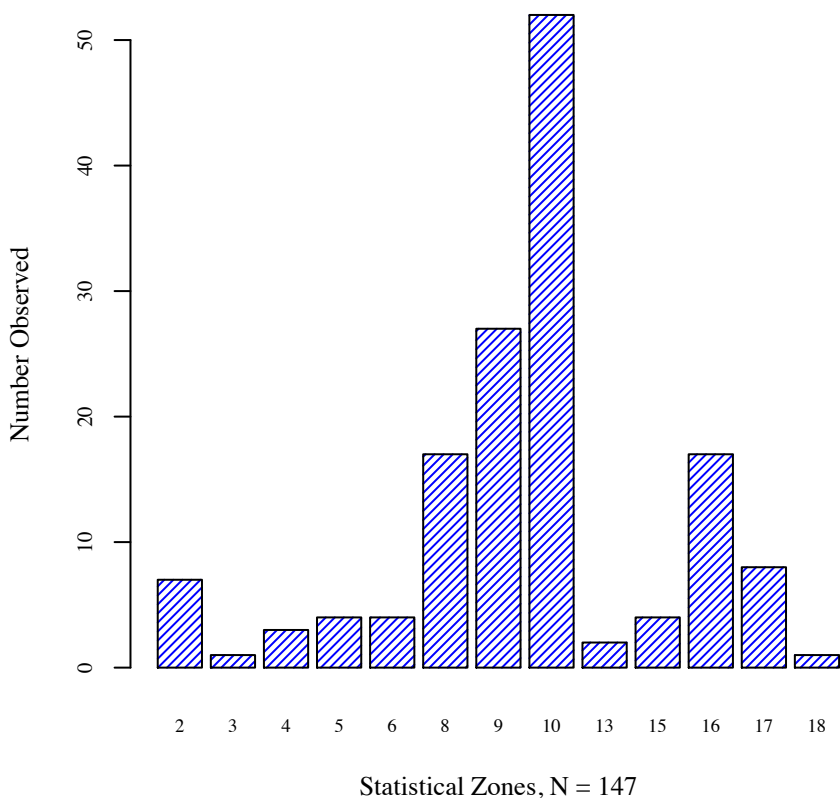
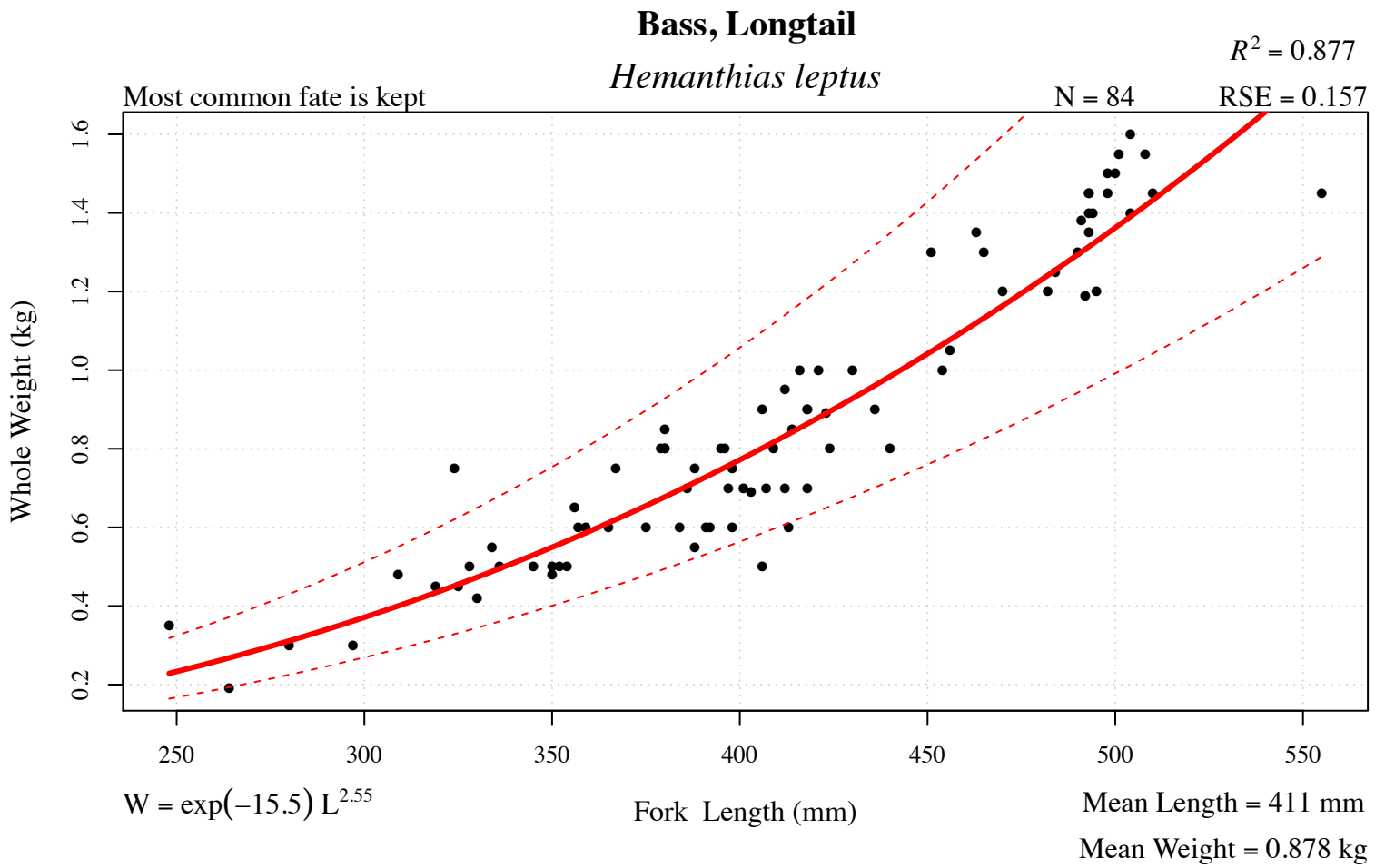
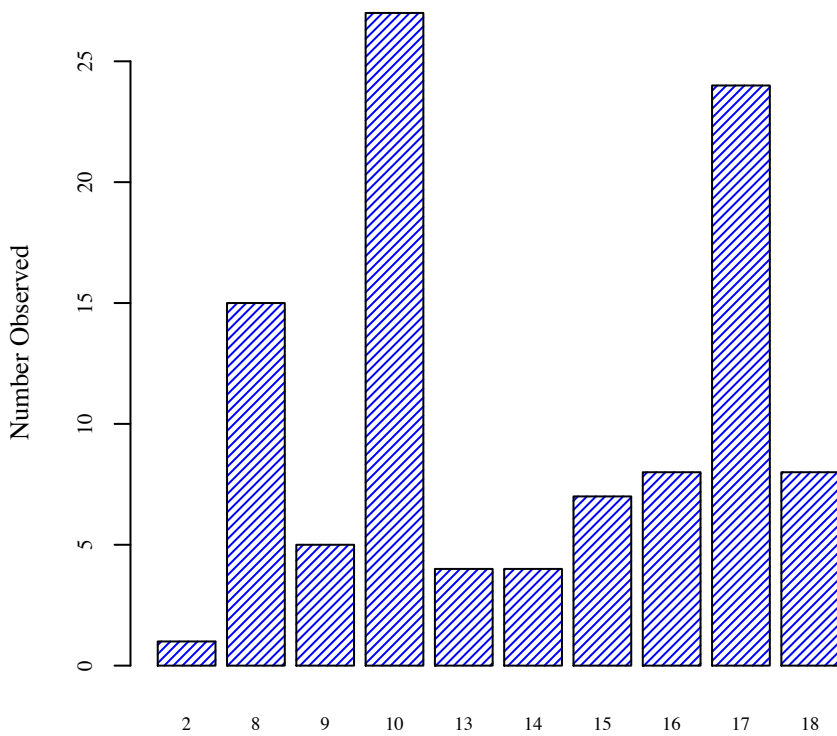


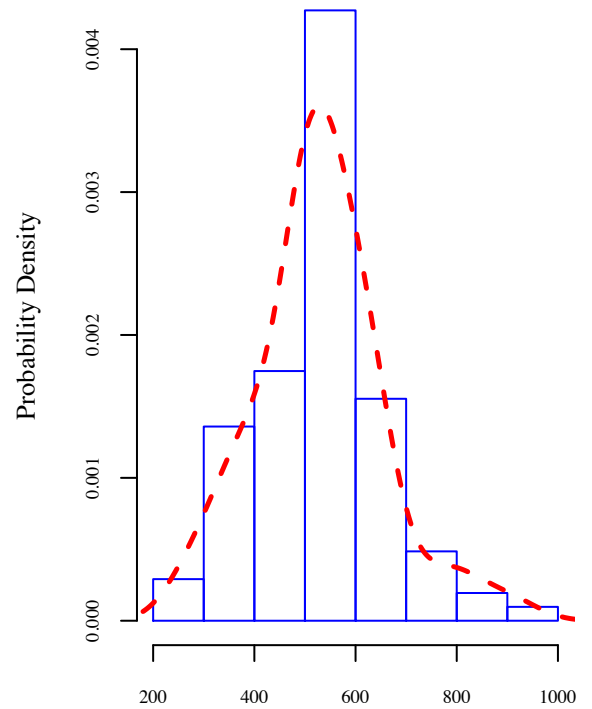
Figure 20 . Regression model, location, and depth information for tattler (*Serranus phoebe*).



More common in the Western Gulf



Statistical Zones, N = 103



Depth (Feet)

Figure 21 . Regression model, location, and depth information for bass, longtail (*Hemanthias leptus*).

Flag, Spanish

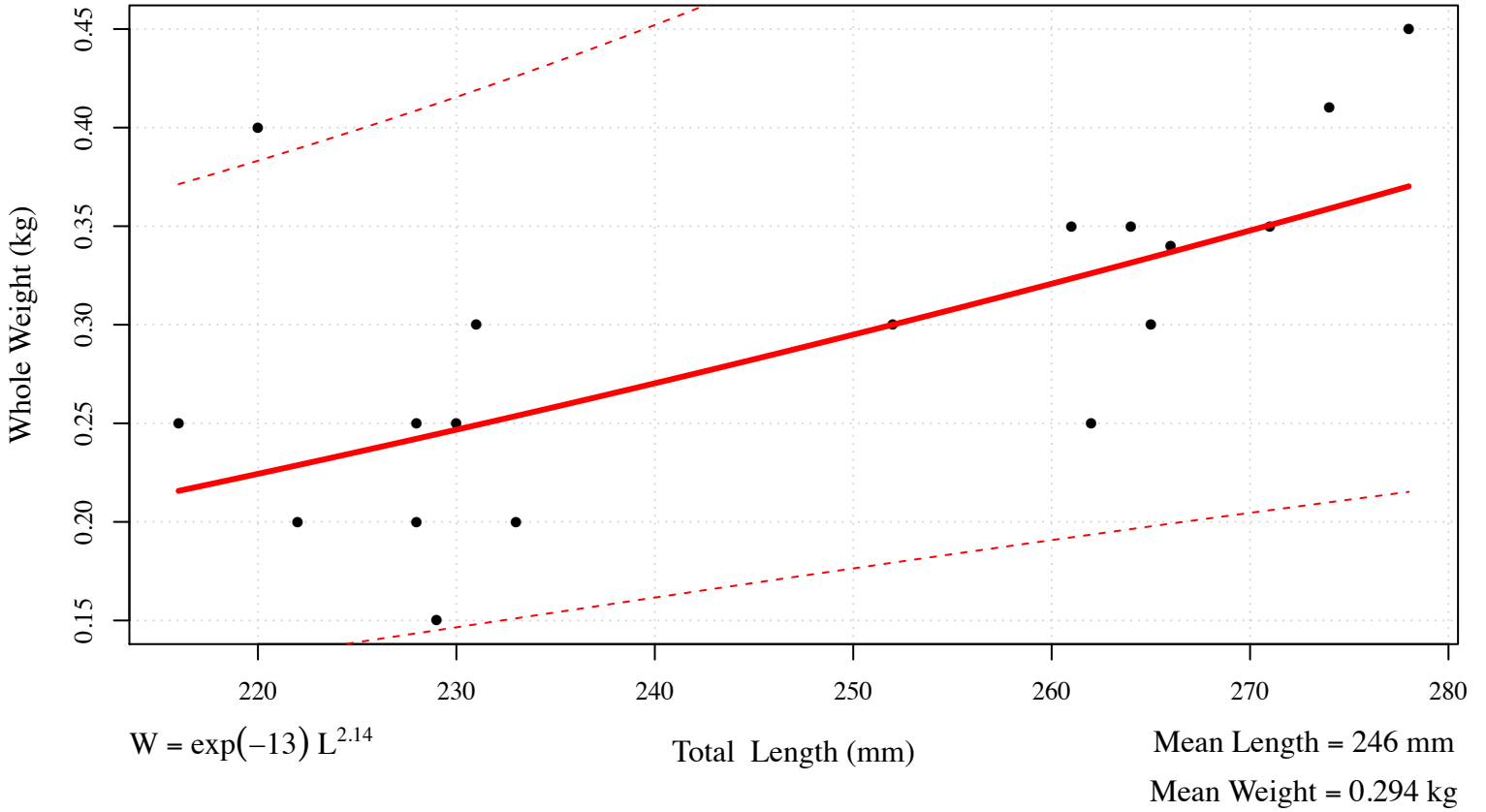
Gonioplectrus hispanus

$R^2 = 0.361$

N = 18

RSE = 0.236

Most common fate is discarded dead



More common in the Eastern Gulf

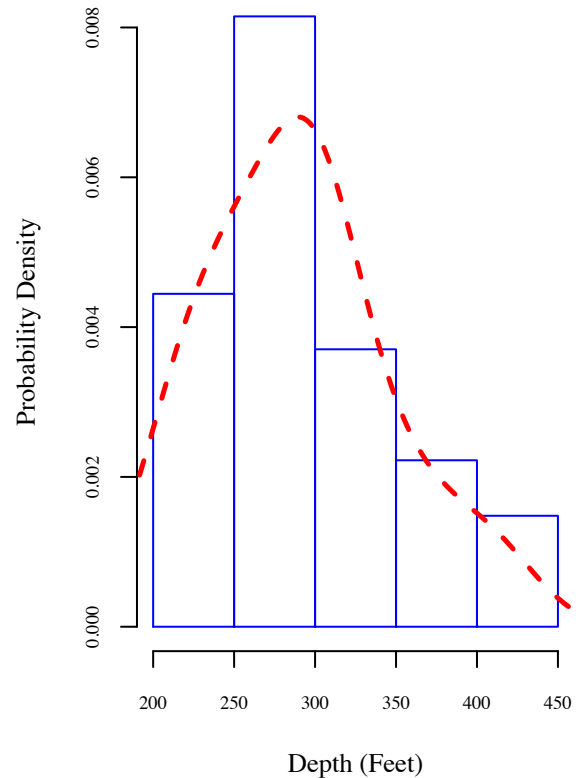
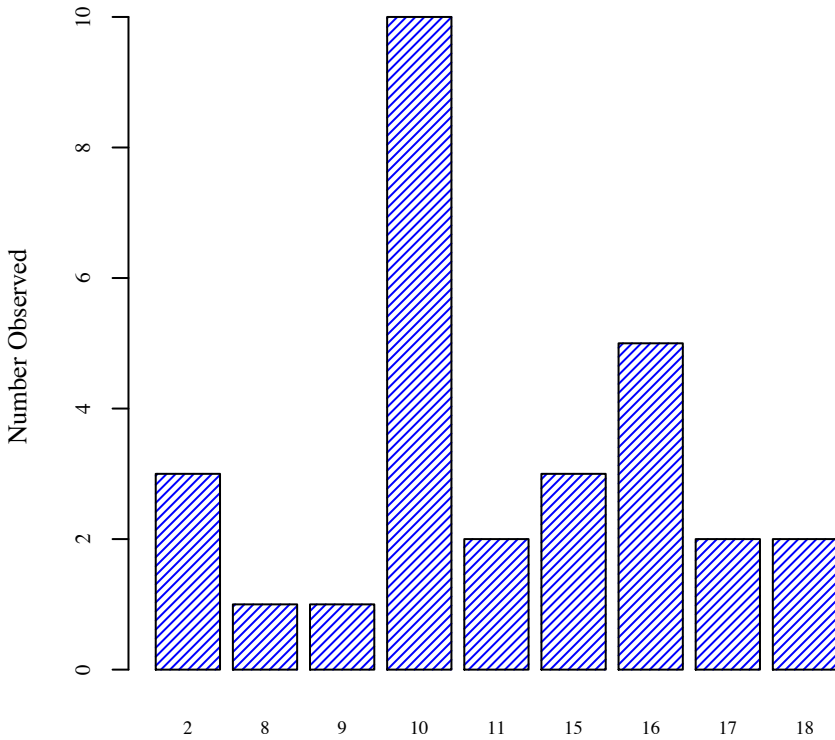
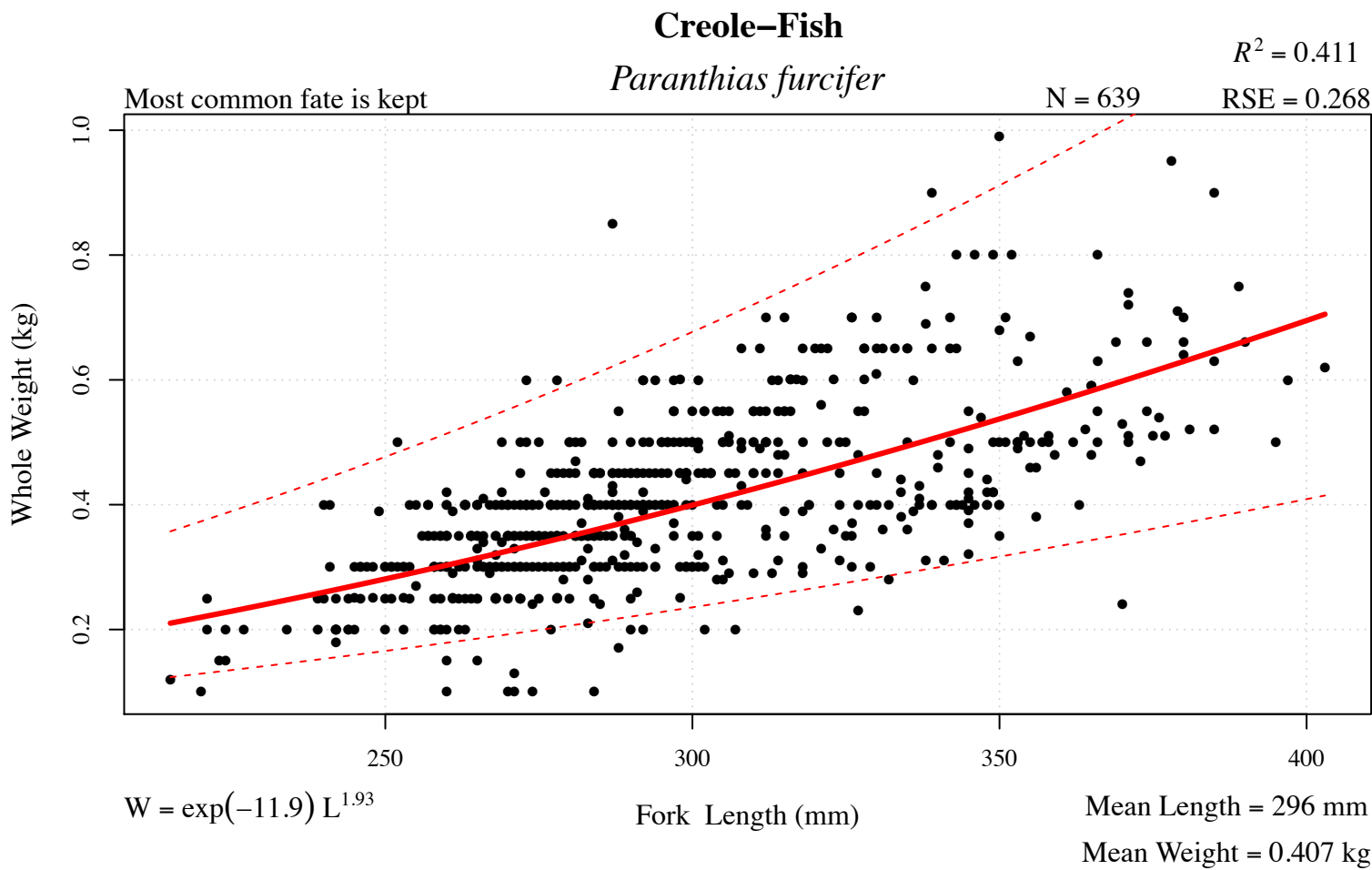


Figure 22 . Regression model, location, and depth information for flag, spanish (*Gonioplectrus hispanus*).



More common in the Western Gulf

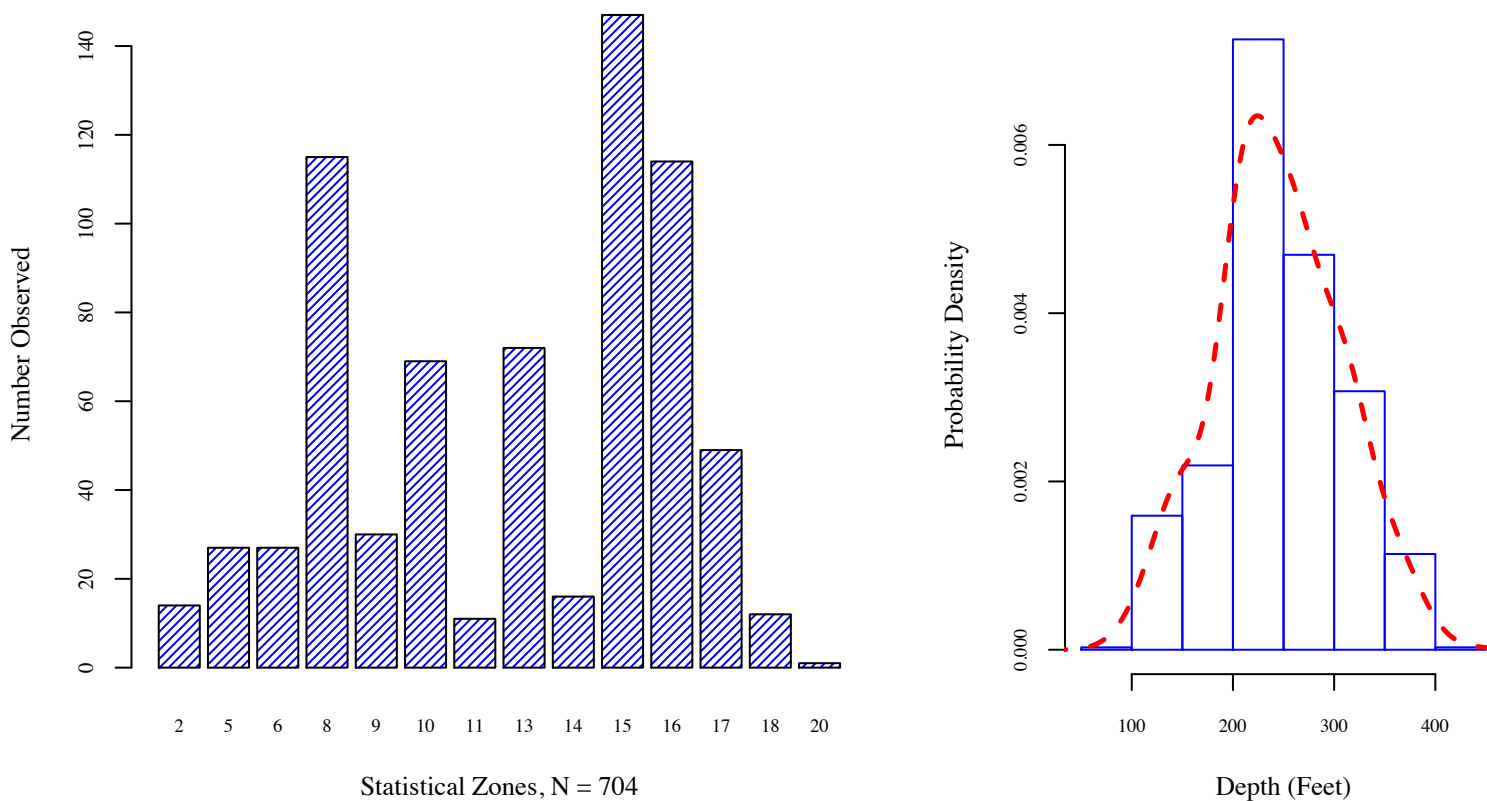
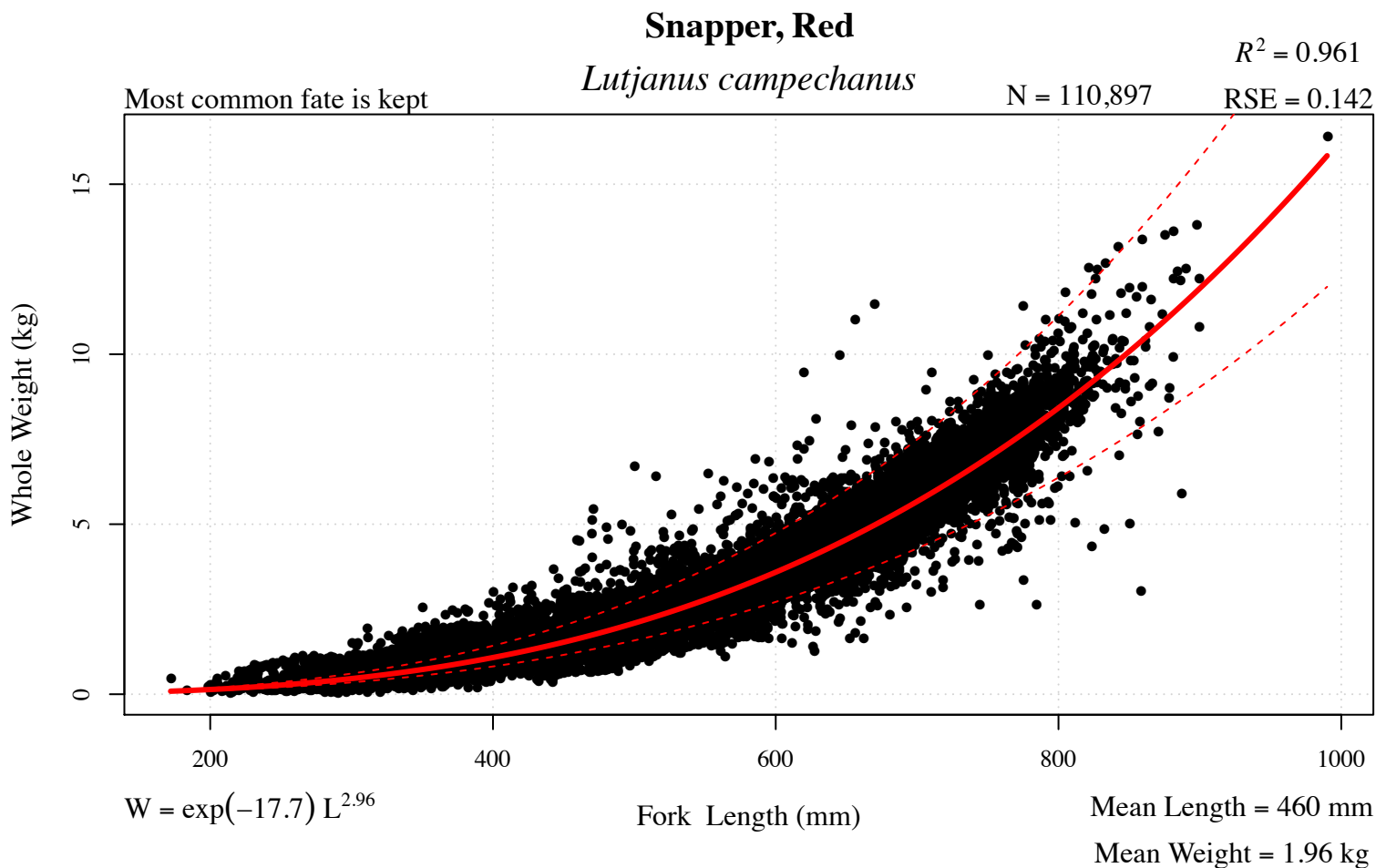


Figure 23 . Regression model, location, and depth information for creole-fish (*Paranthias furcifer*).



More common in the Western Gulf

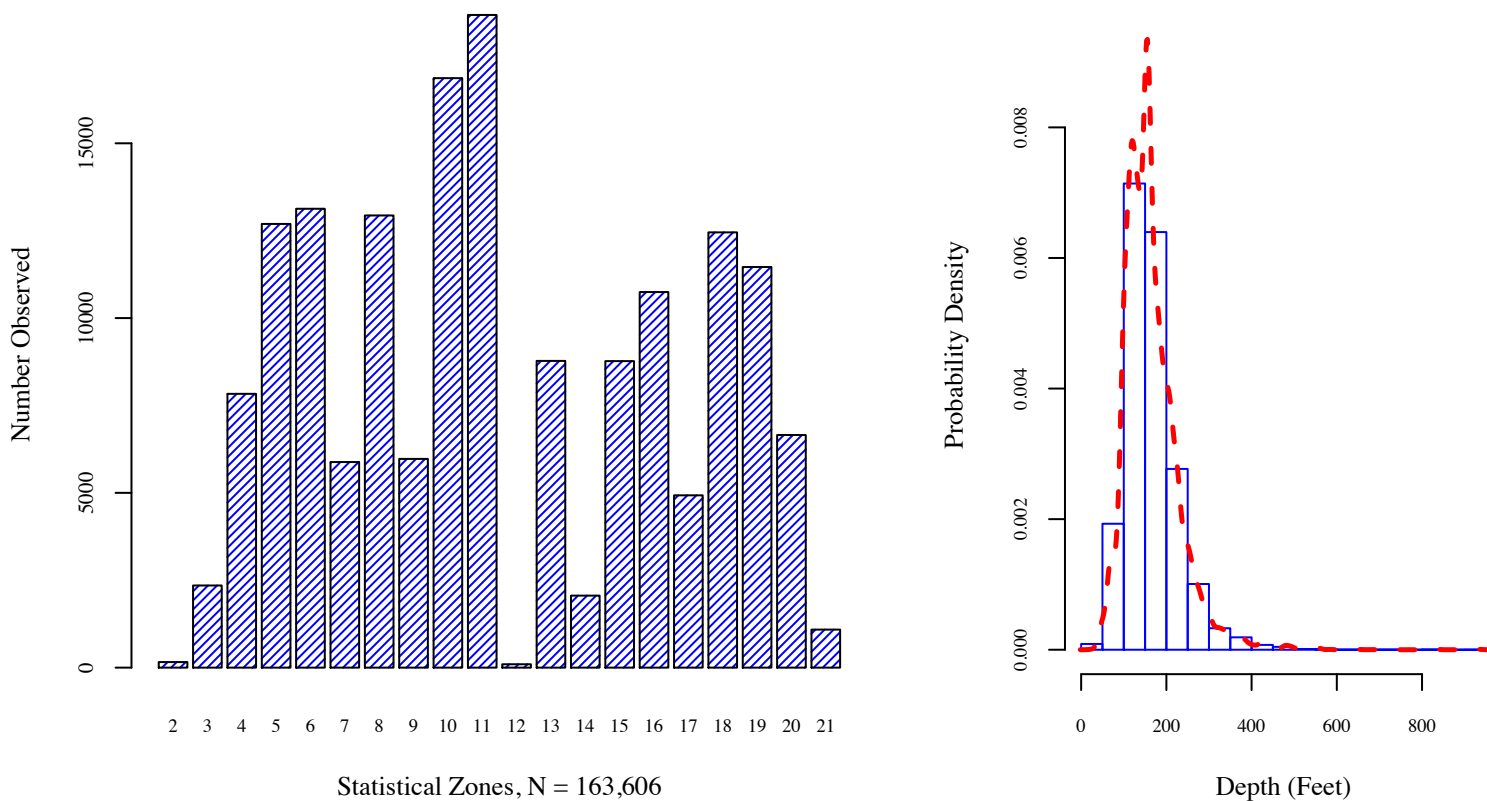
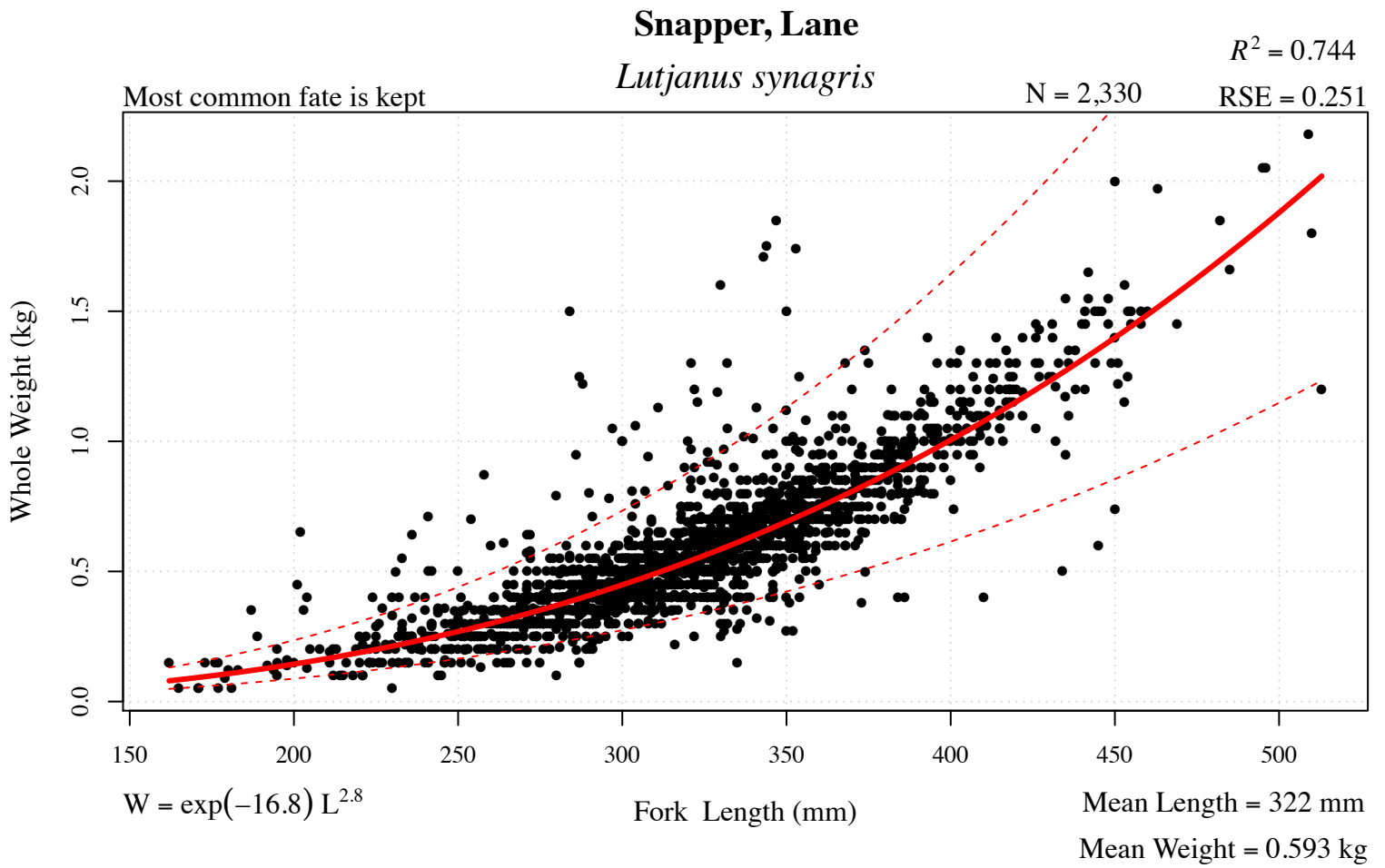


Figure 24 . Regression model, location, and depth information for snapper, red (*Lutjanus campechanus*).



More common in the Eastern Gulf

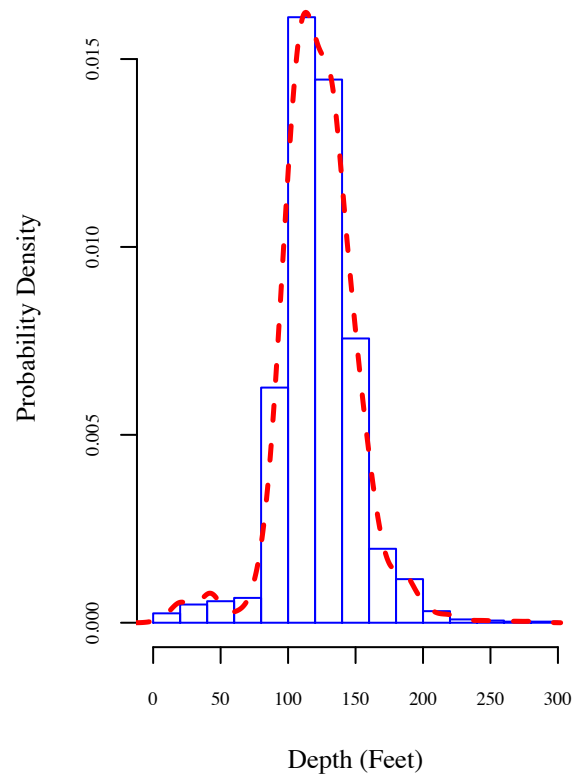
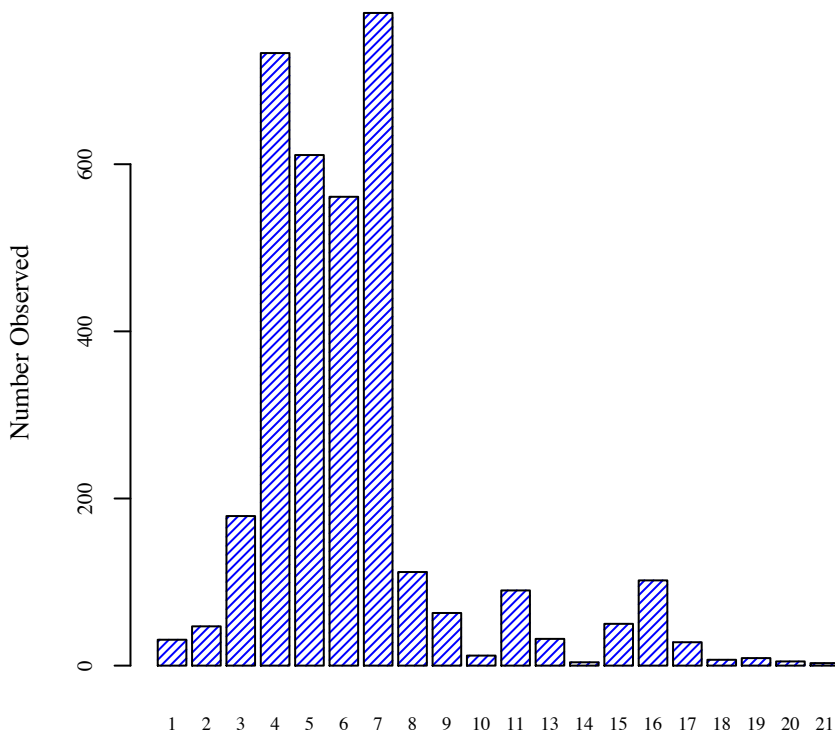


Figure 25 . Regression model, location, and depth information for snapper, lane (*Lutjanus synagris*).

Snapper, Mutton

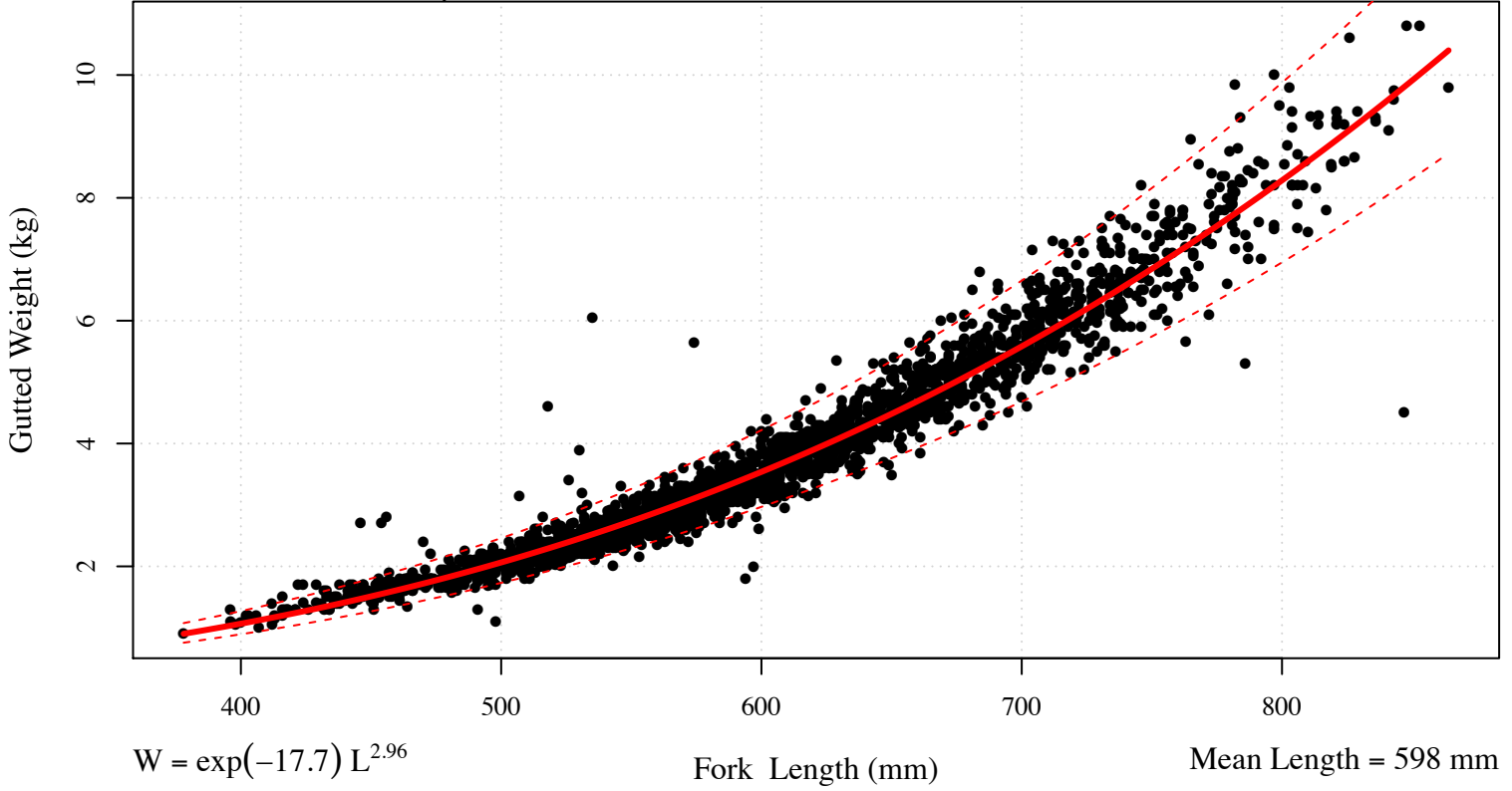
Lutjanus analis

$R^2 = 0.96$

N = 2,502

RSE = 0.0895

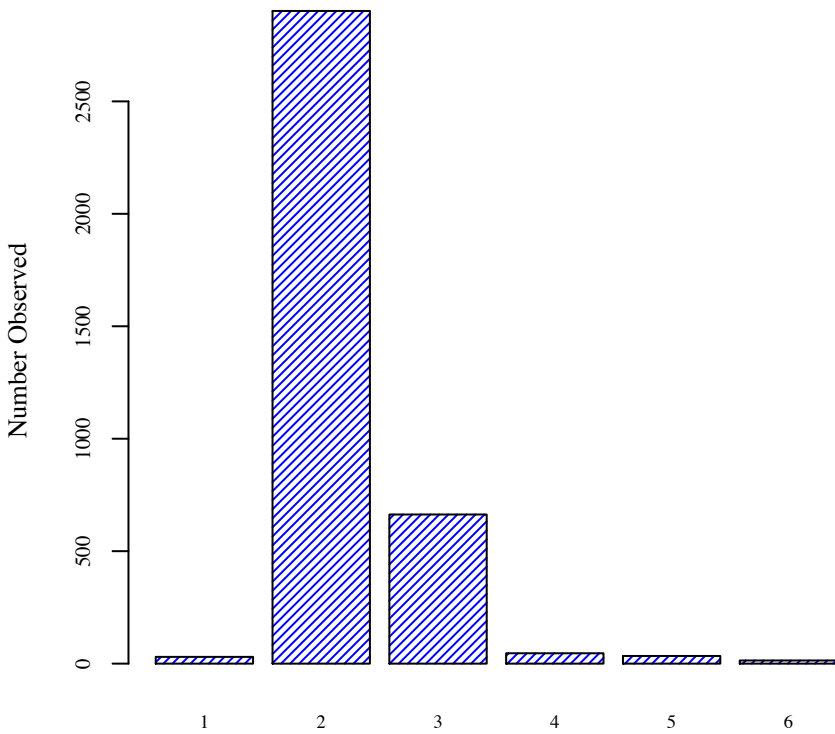
Most common fate is kept



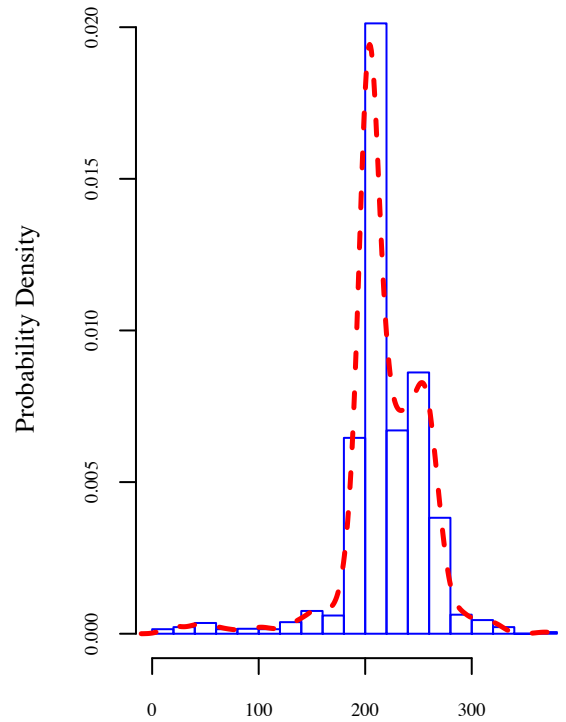
Mean Length = 598 mm

Mean Weight = 3.75 kg

More common in the Eastern Gulf



Statistical Zones, N = 3,689



Depth (Feet)

Figure 26 . Regression model, location, and depth information for snapper, mutton (*Lutjanus analis*).

Snapper, Gray

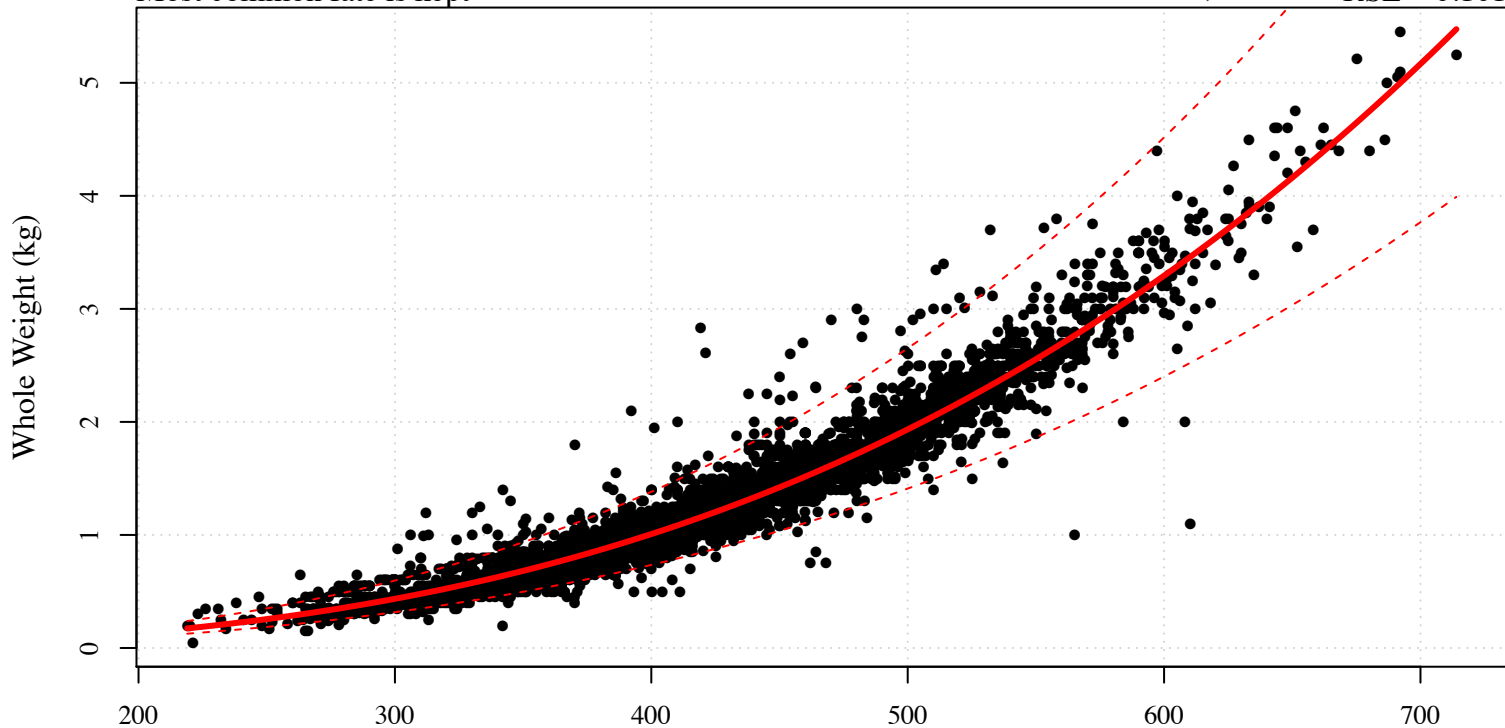
Lutjanus griseus

$R^2 = 0.915$

N = 4,001

RSE = 0.161

Most common fate is kept



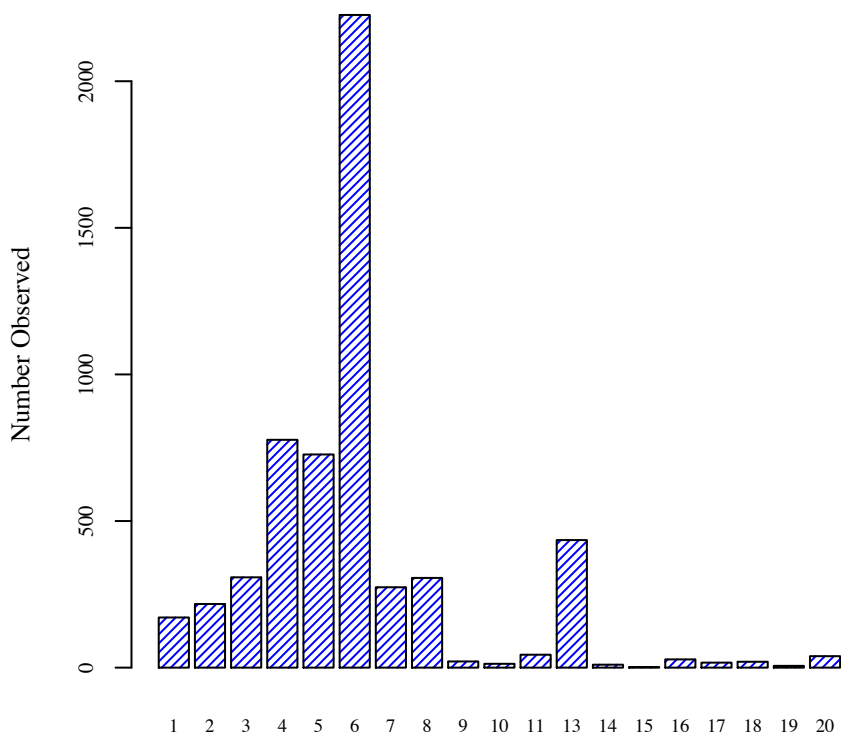
$$W = \exp(-17.5) L^{2.92}$$

Fork Length (mm)

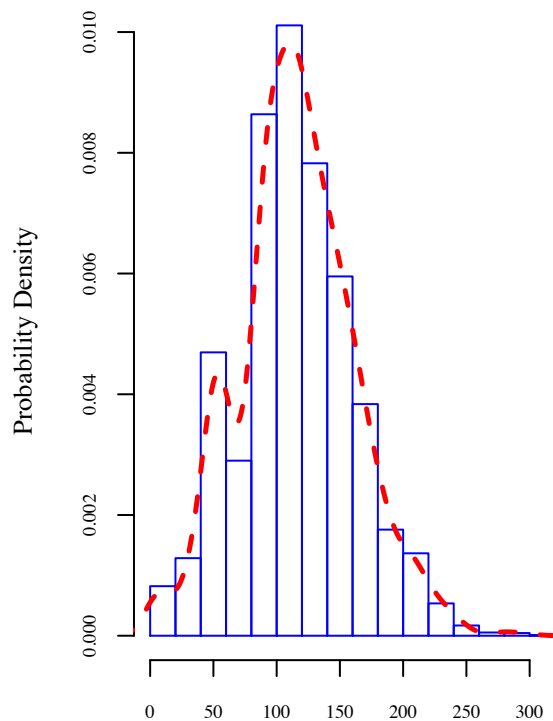
Mean Length = 426 mm

Mean Weight = 1.34 kg

More common in the Eastern Gulf



Statistical Zones, N = 5,642



Depth (Feet)

Figure 27 . Regression model, location, and depth information for snapper, gray (*Lutjanus griseus*).

Snapper, Cubera

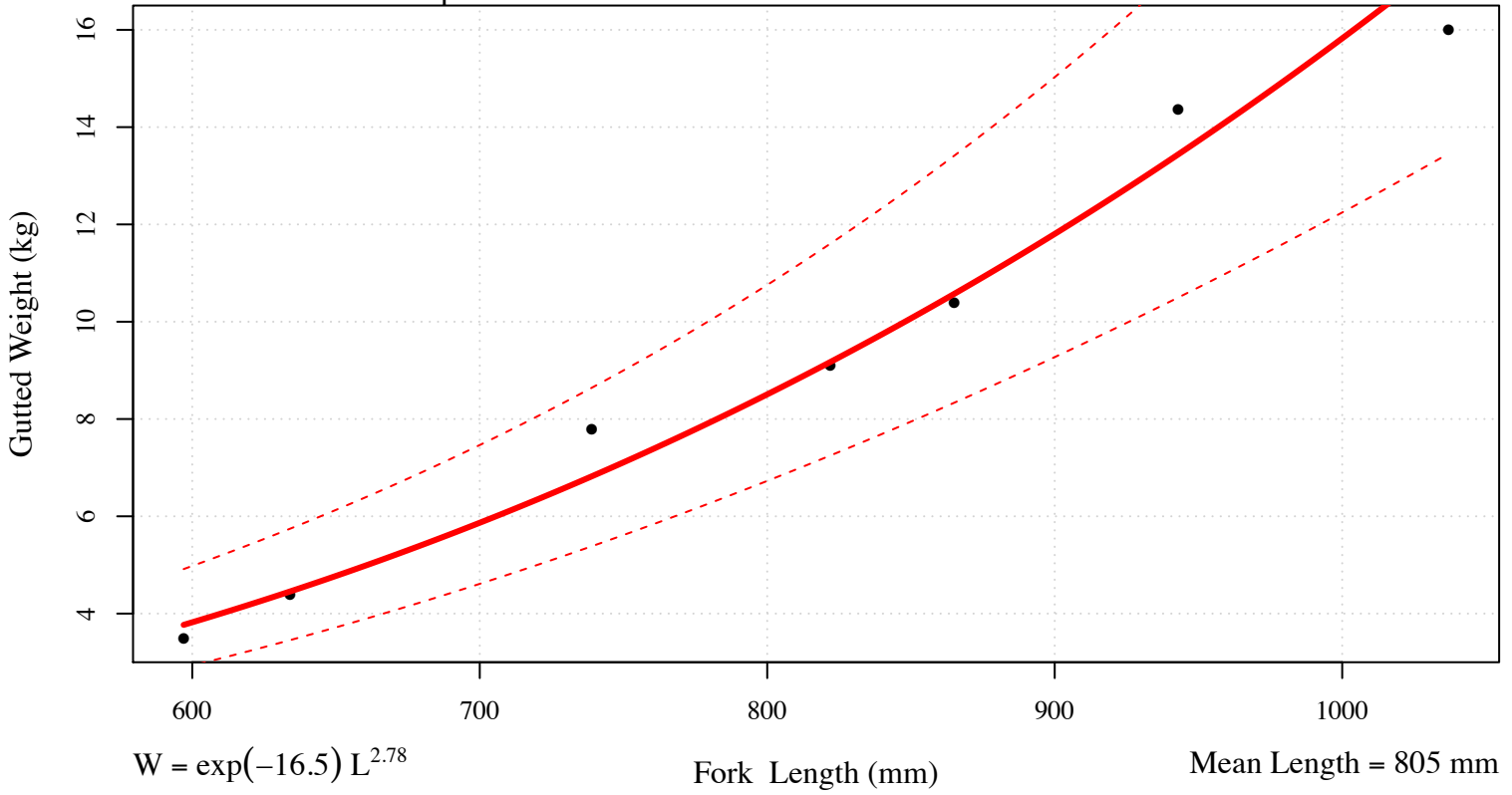
Lutjanus cyanopterus

$R^2 = 0.977$

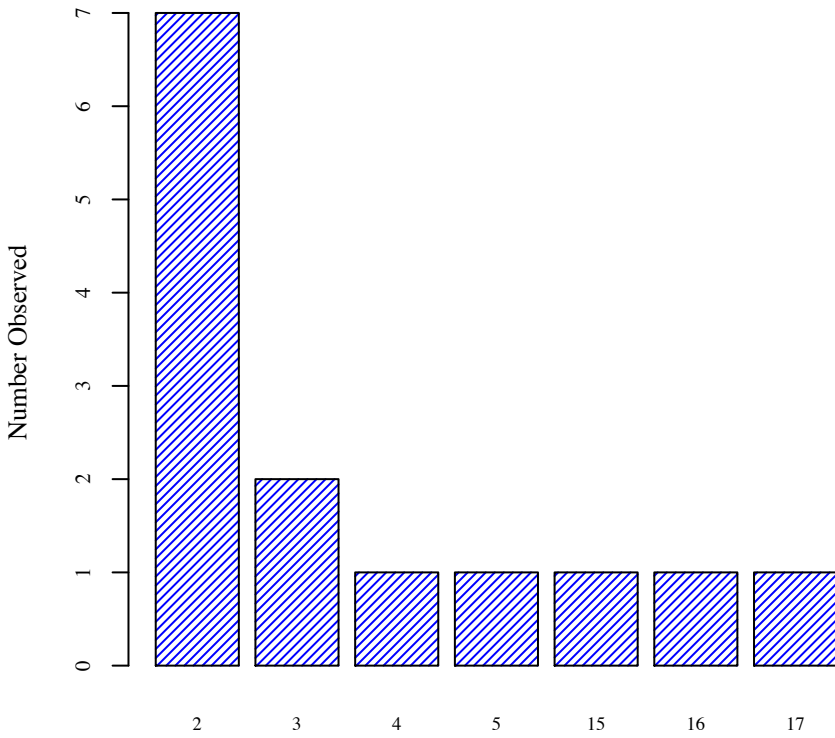
N = 7

RSE = 0.0854

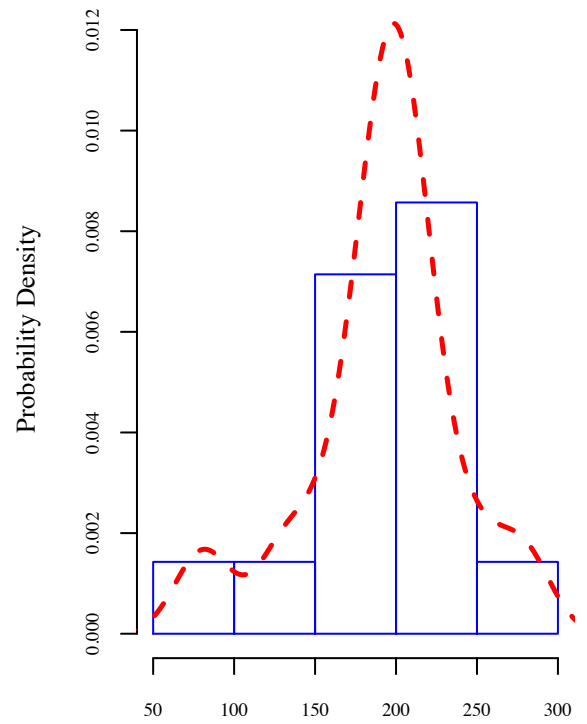
Most common fate is kept



More common in the Eastern Gulf



Statistical Zones, N = 14



Depth (Feet)

Figure 28 . Regression model, location, and depth information for snapper, cubera (*Lutjanus cyanopterus*).

Snapper, Silk

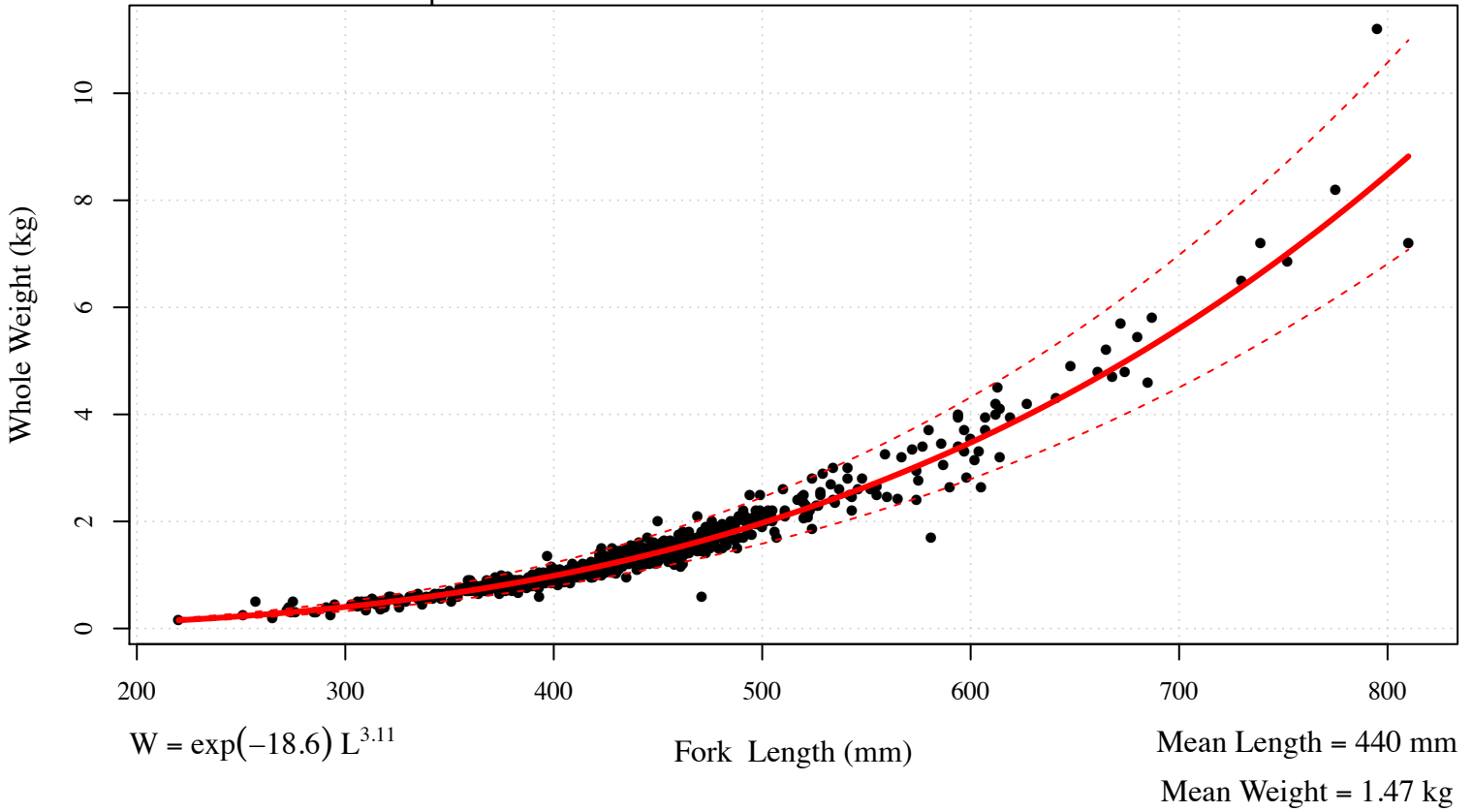
Lutjanus vivanus

$R^2 = 0.952$

N = 785

RSE = 0.111

Most common fate is kept



More common in the Eastern Gulf

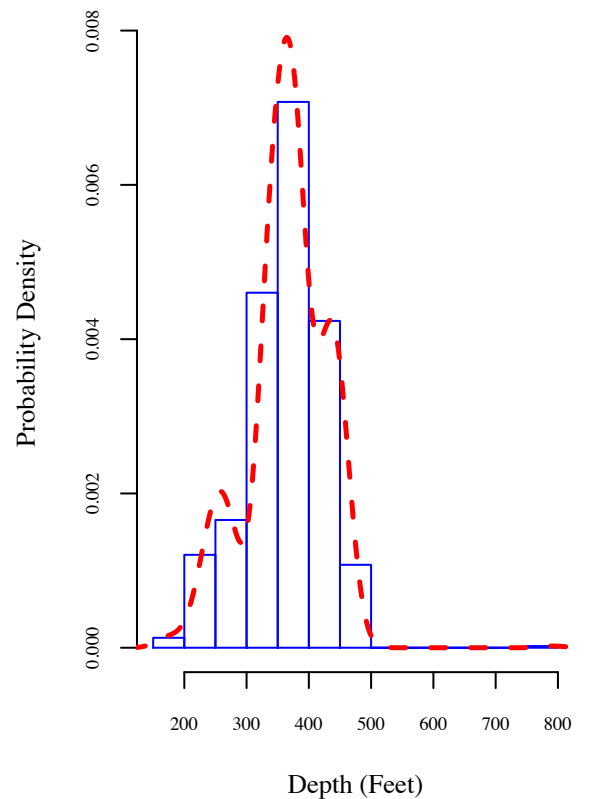
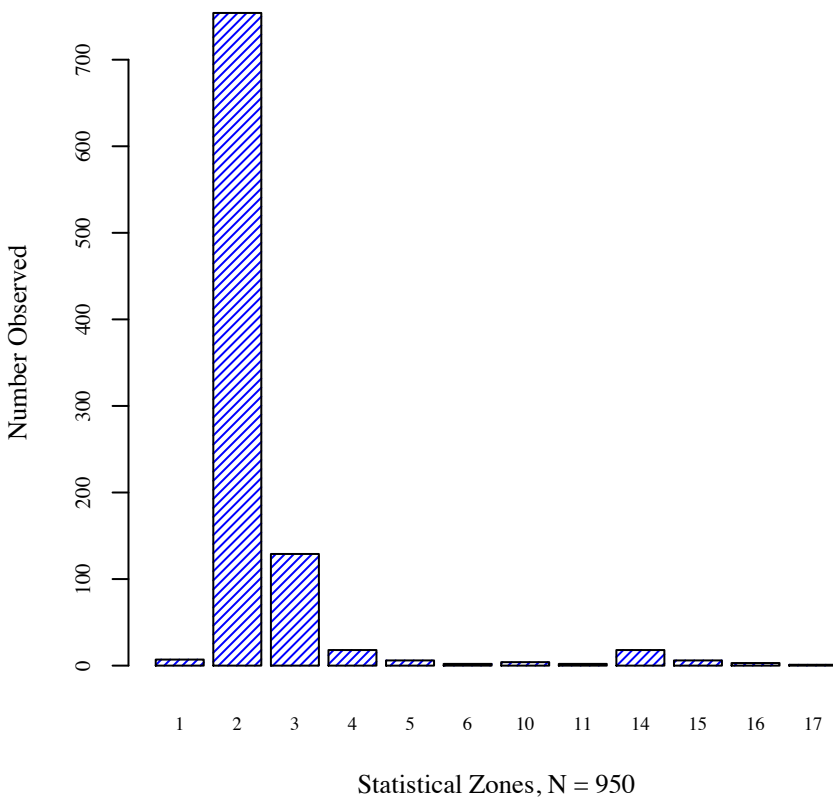
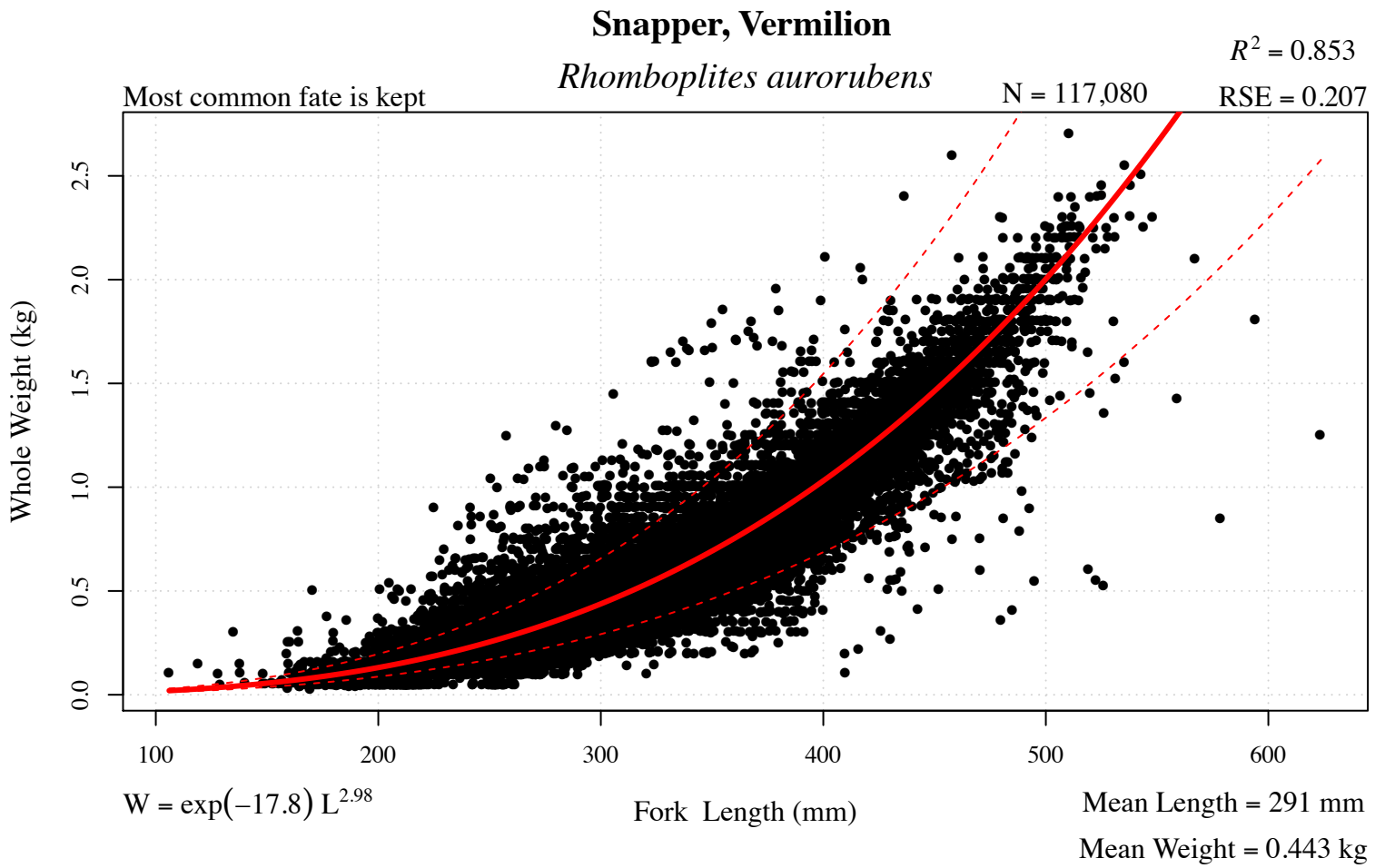
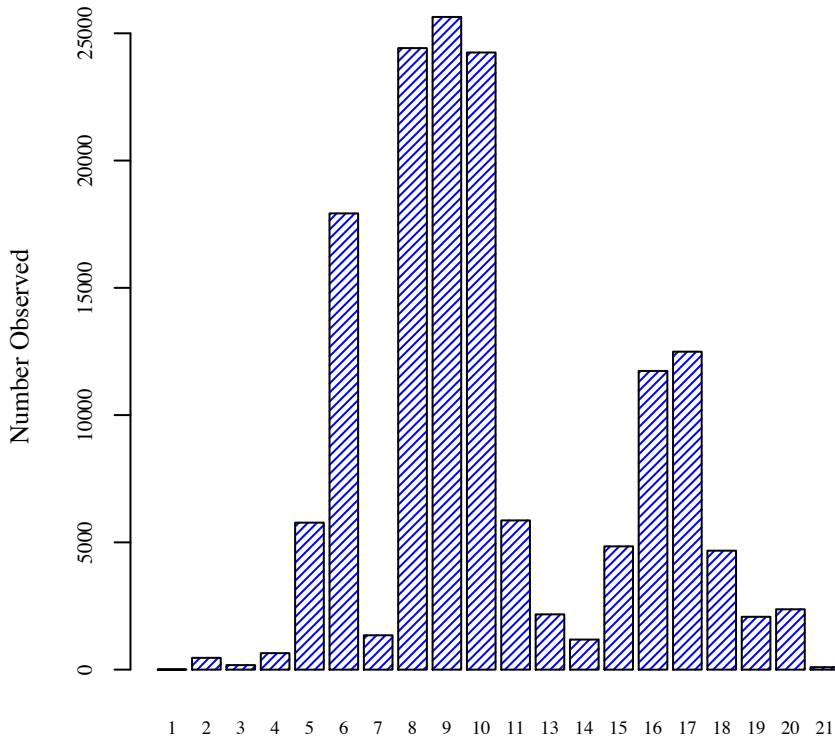


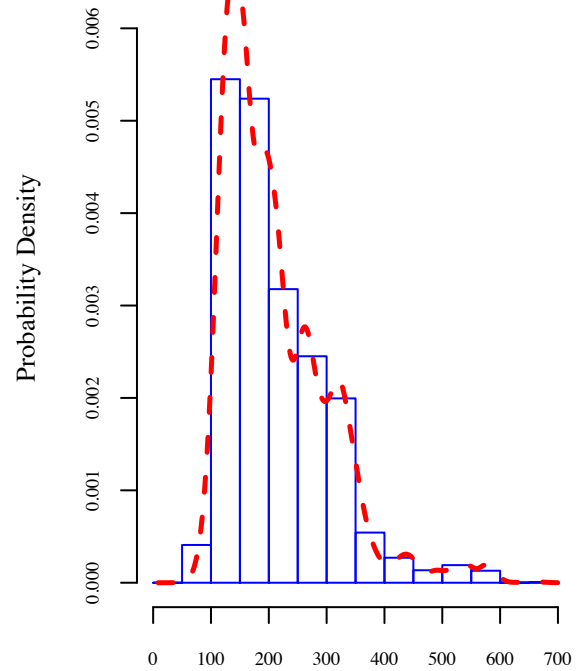
Figure 29 . Regression model, location, and depth information for snapper, silk (*Lutjanus vivanus*).



More common in the Eastern Gulf

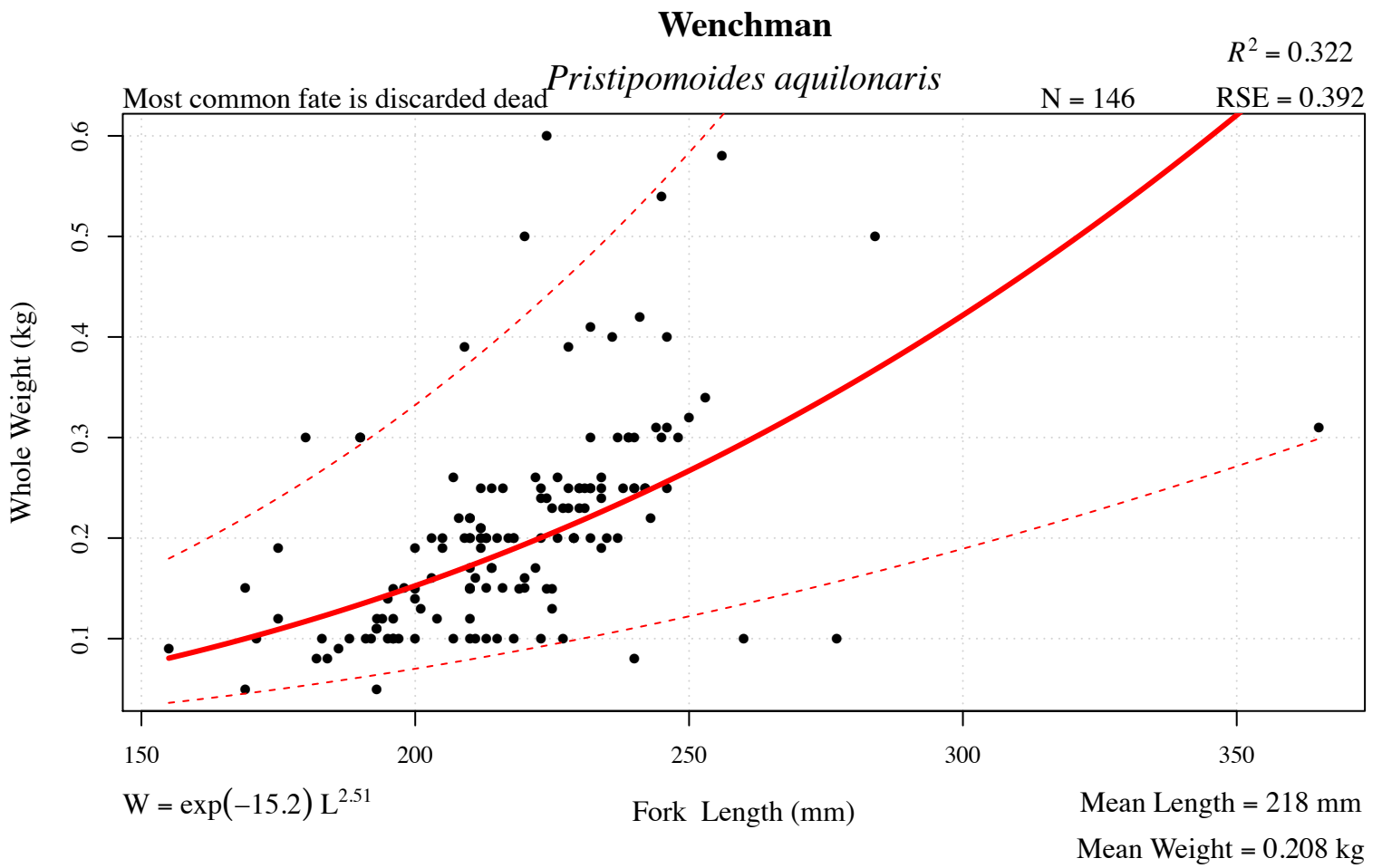


Statistical Zones, N = 148,173



Depth (Feet)

Figure 30 . Regression model, location, and depth information for snapper, vermilion (*Rhomboplites aurorubens*).



More common in the Western Gulf

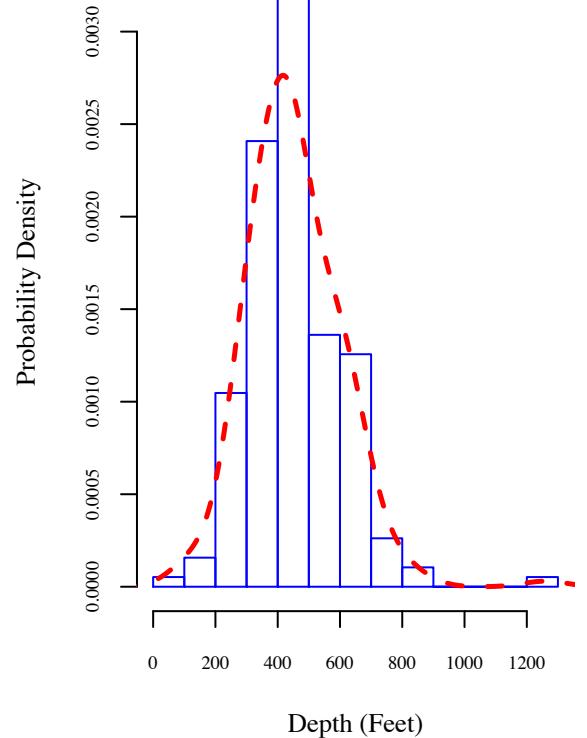
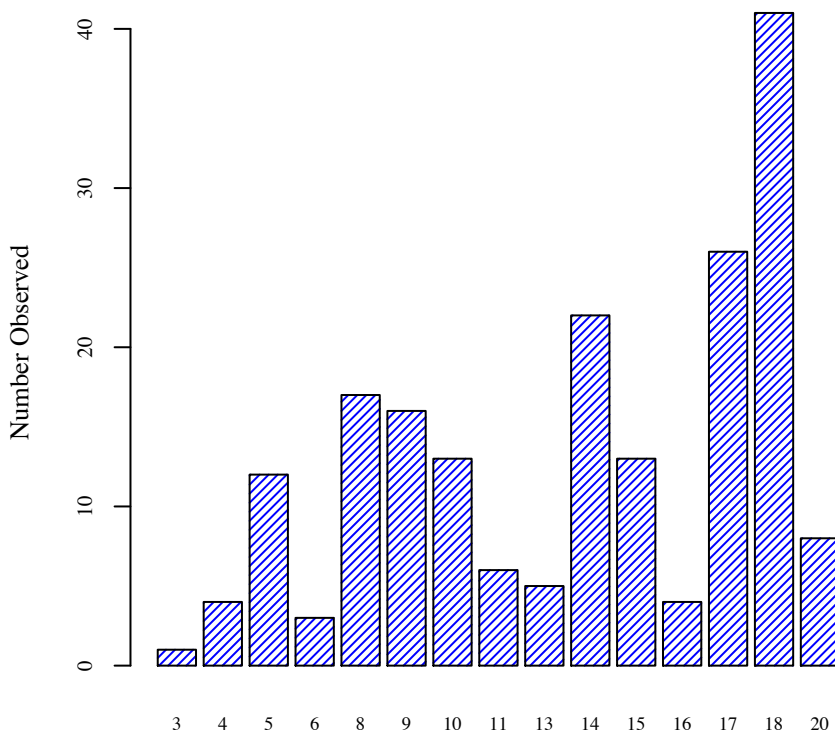


Figure 31 . Regression model, location, and depth information for wenchman (*Pristipomoides aquilonaris*).

Snapper, Queen

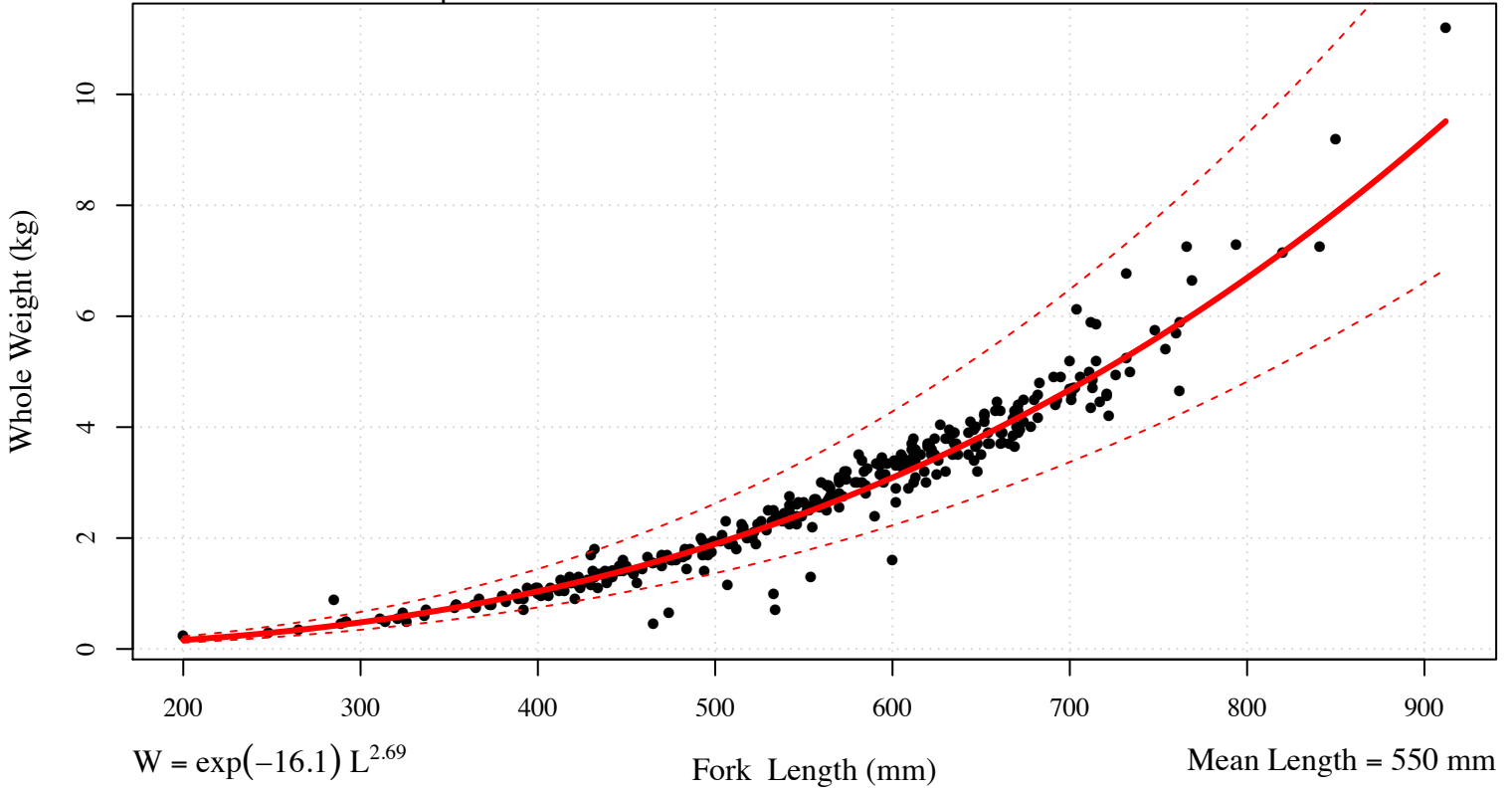
Etelis Oculatus

$R^2 = 0.935$

N = 328

RSE = 0.166

Most common fate is kept



More common in the Western Gulf

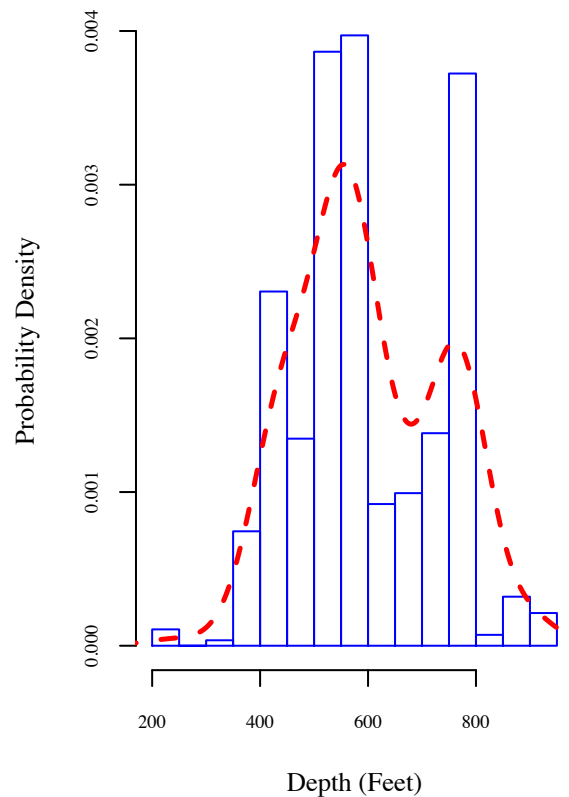
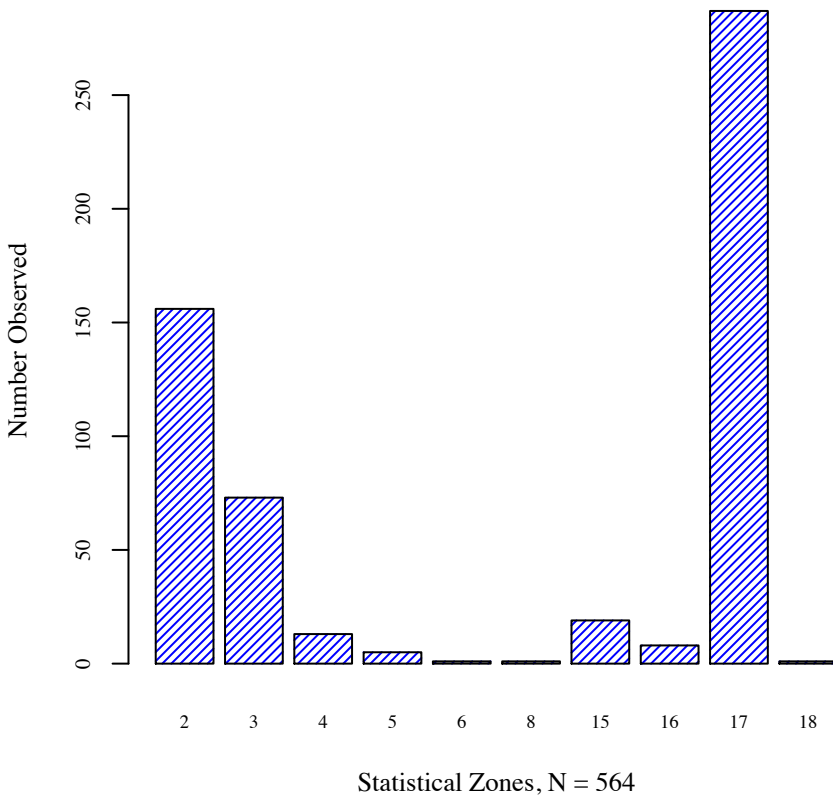


Figure 32 . Regression model, location, and depth information for snapper, queen (*Etelis Oculatus*).

Snapper, Yellowtail

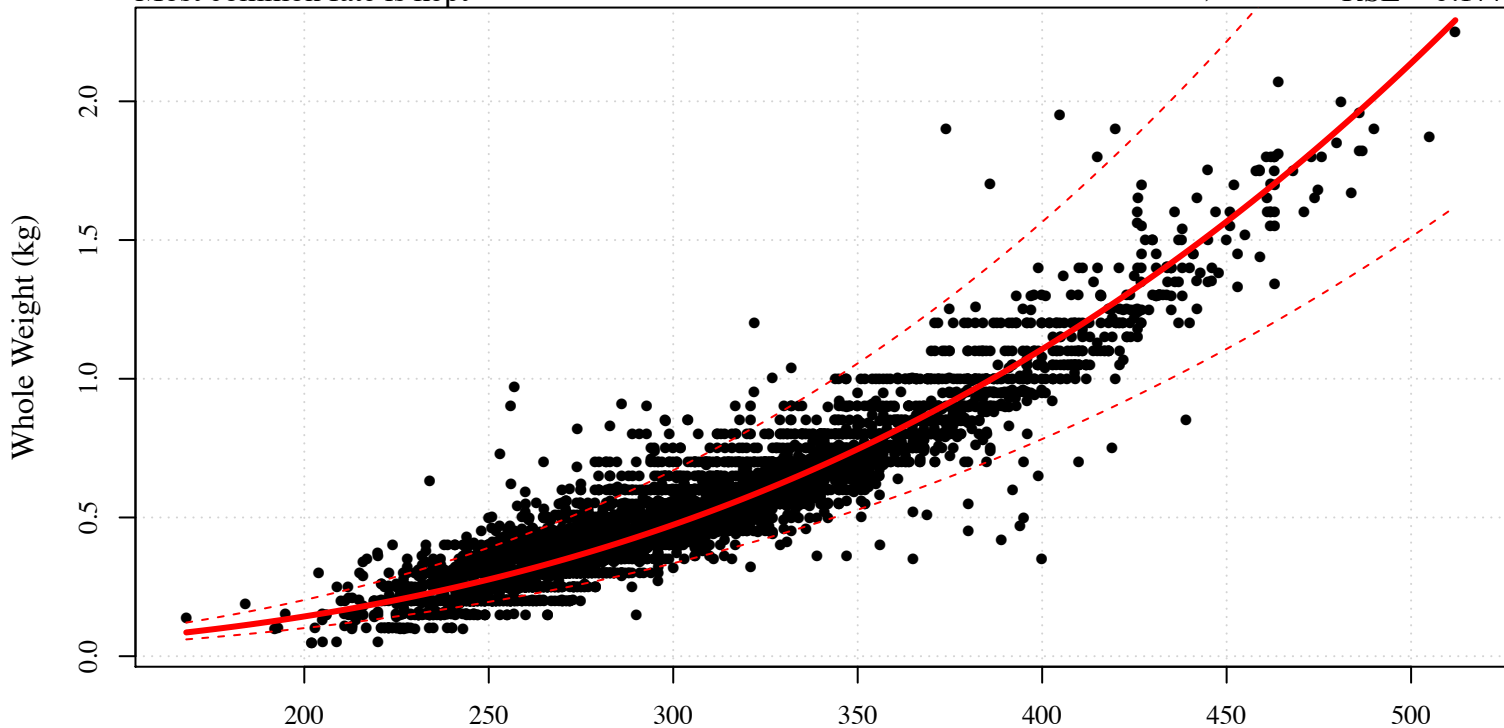
Ocyurus chrysurus

$R^2 = 0.839$

N = 7,740

RSE = 0.177

Most common fate is kept



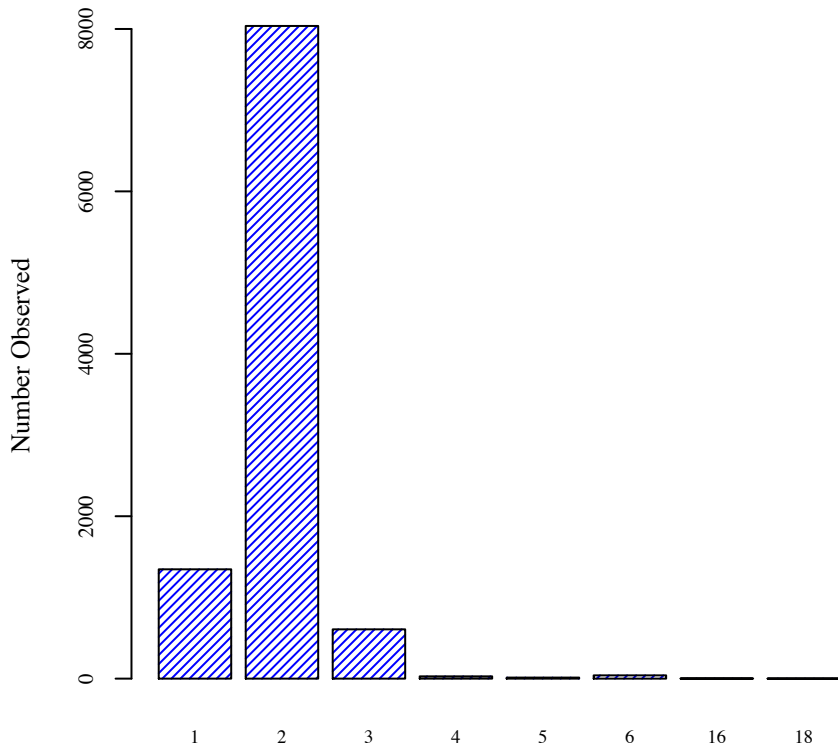
$$W = \exp(-17.6) L^{2.95}$$

Fork Length (mm)

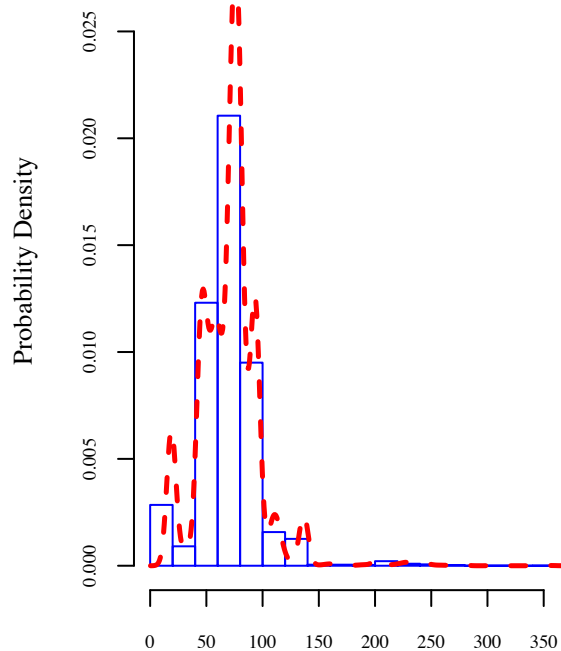
Mean Length = 300 mm

Mean Weight = 0.507 kg

More common in the Eastern Gulf

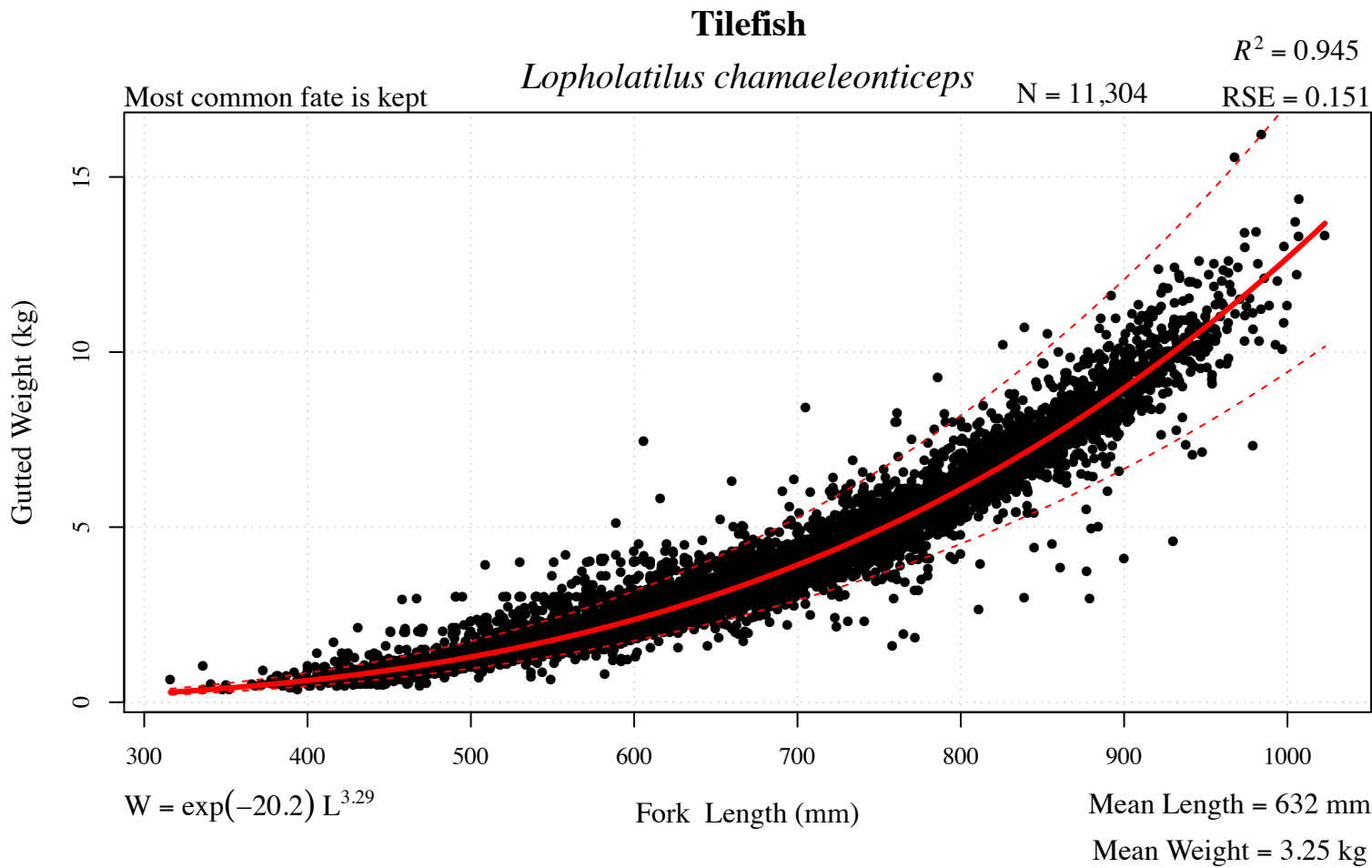


Statistical Zones, N = 10,074



Depth (Feet)

Figure 33 . Regression model, location, and depth information for snapper, yellowtail (*Ocyurus chrysurus*).



More common in the Eastern Gulf

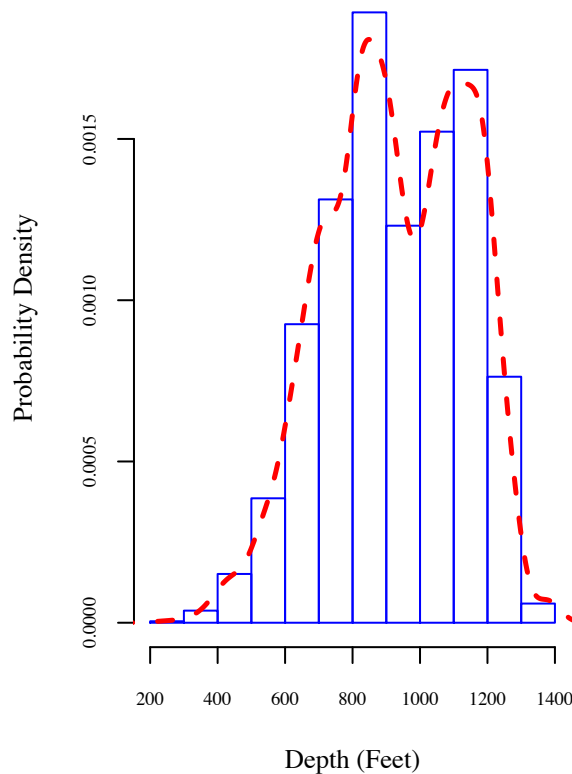
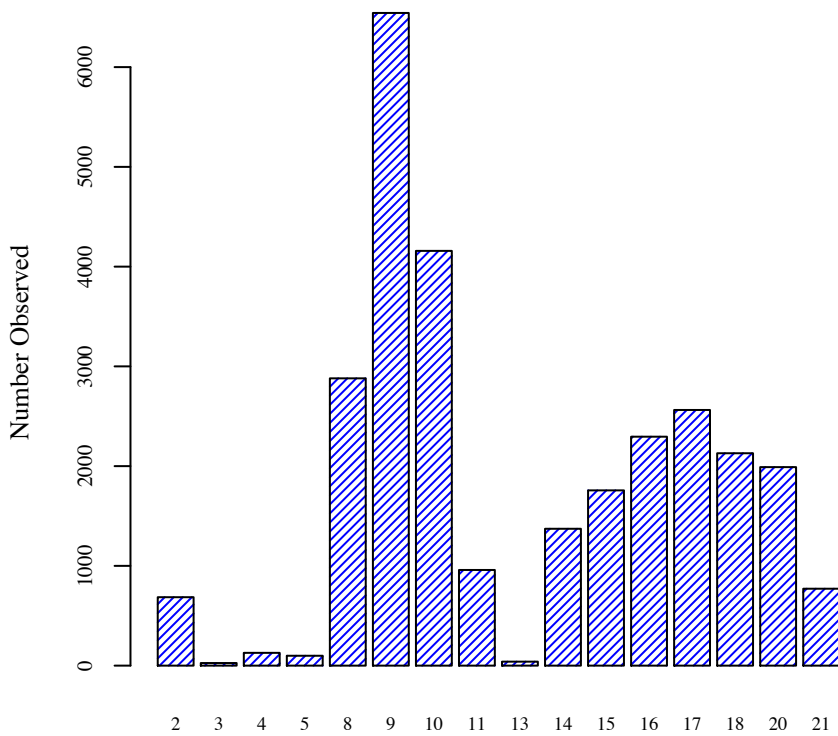
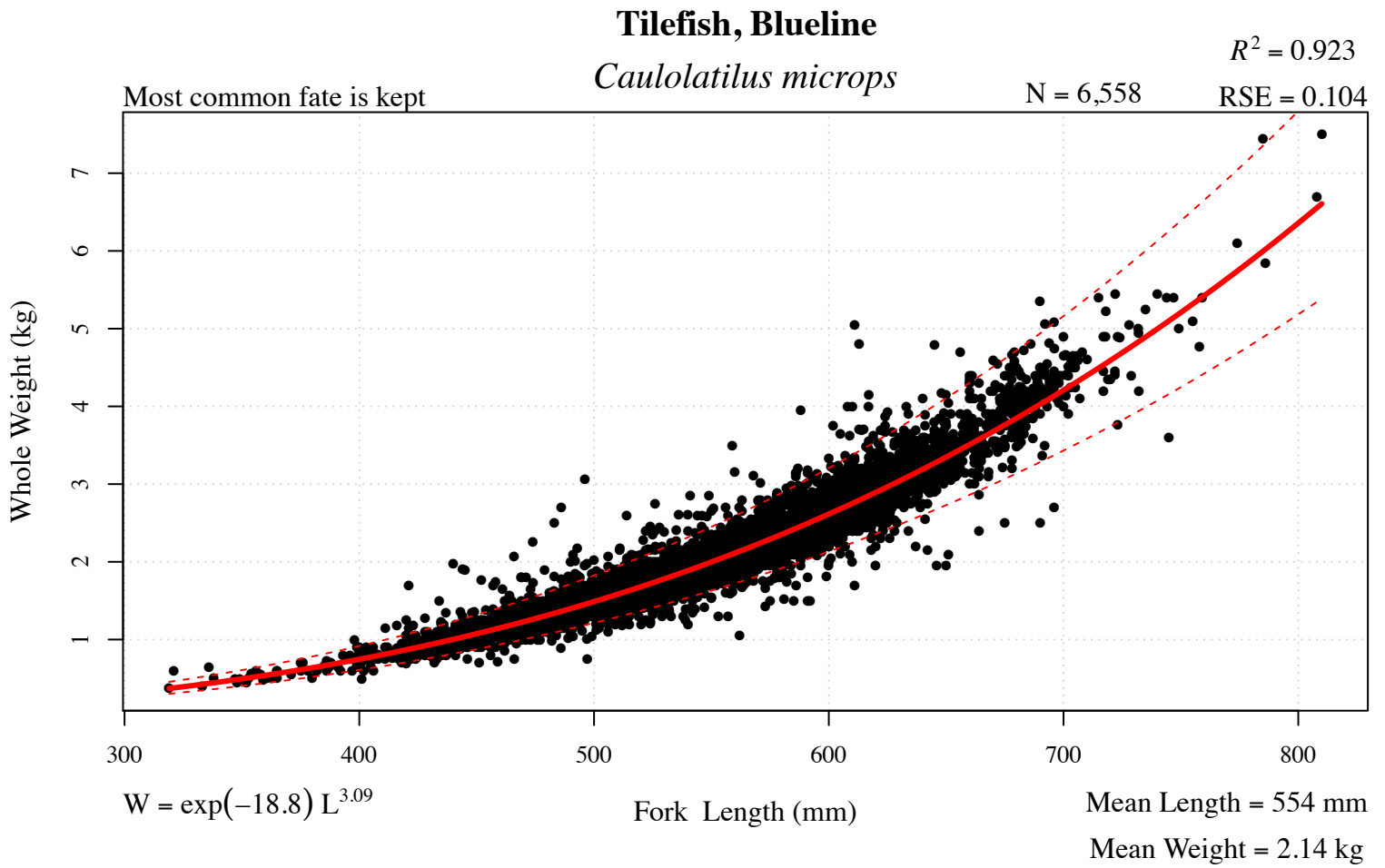


Figure 34 . Regression model, location, and depth information for tilefish (*Lopholatilus chamaeleonticeps*).



More common in the Eastern Gulf

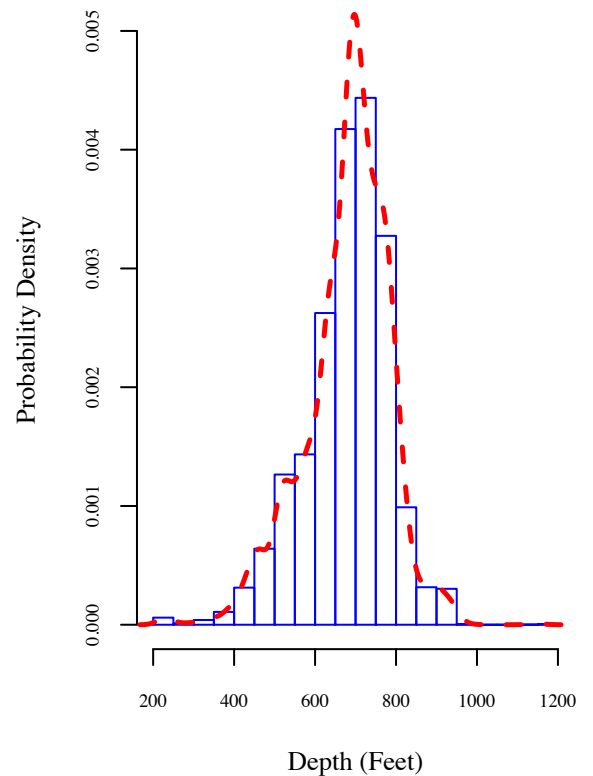
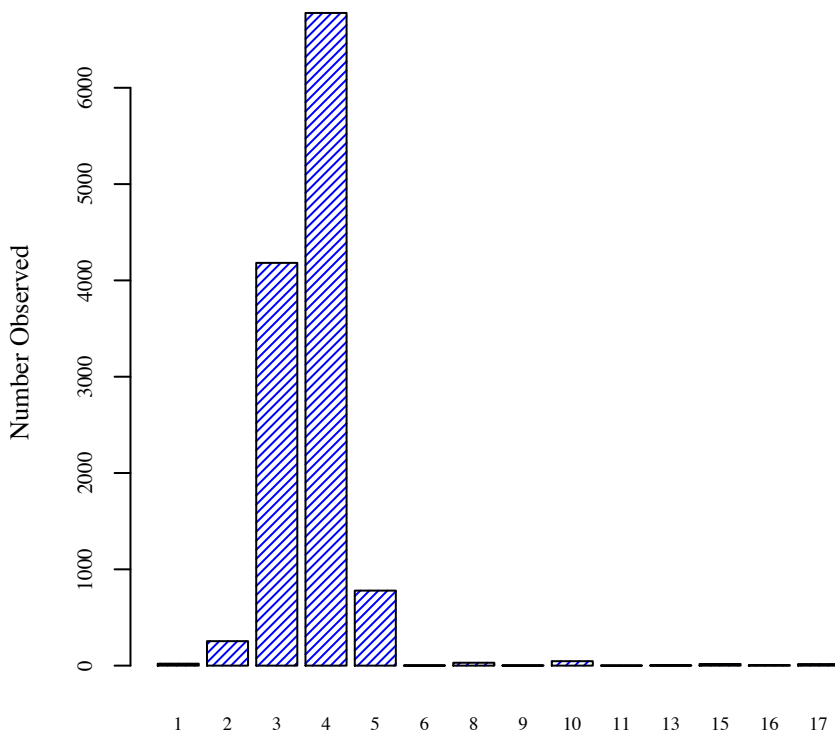
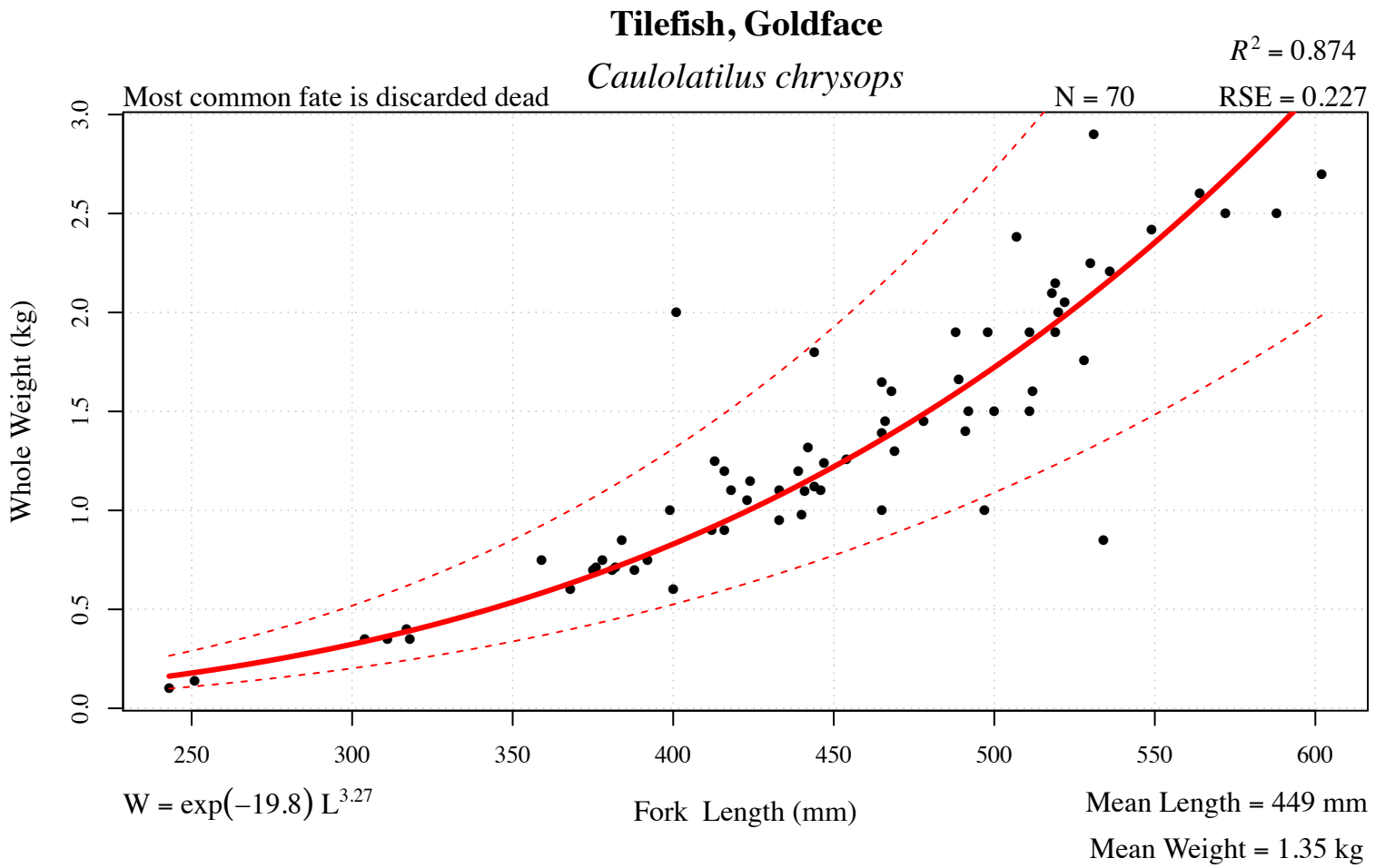


Figure 35 . Regression model, location, and depth information for tilefish, blueline (*Caulolatilus microps*).



More common in the Western Gulf

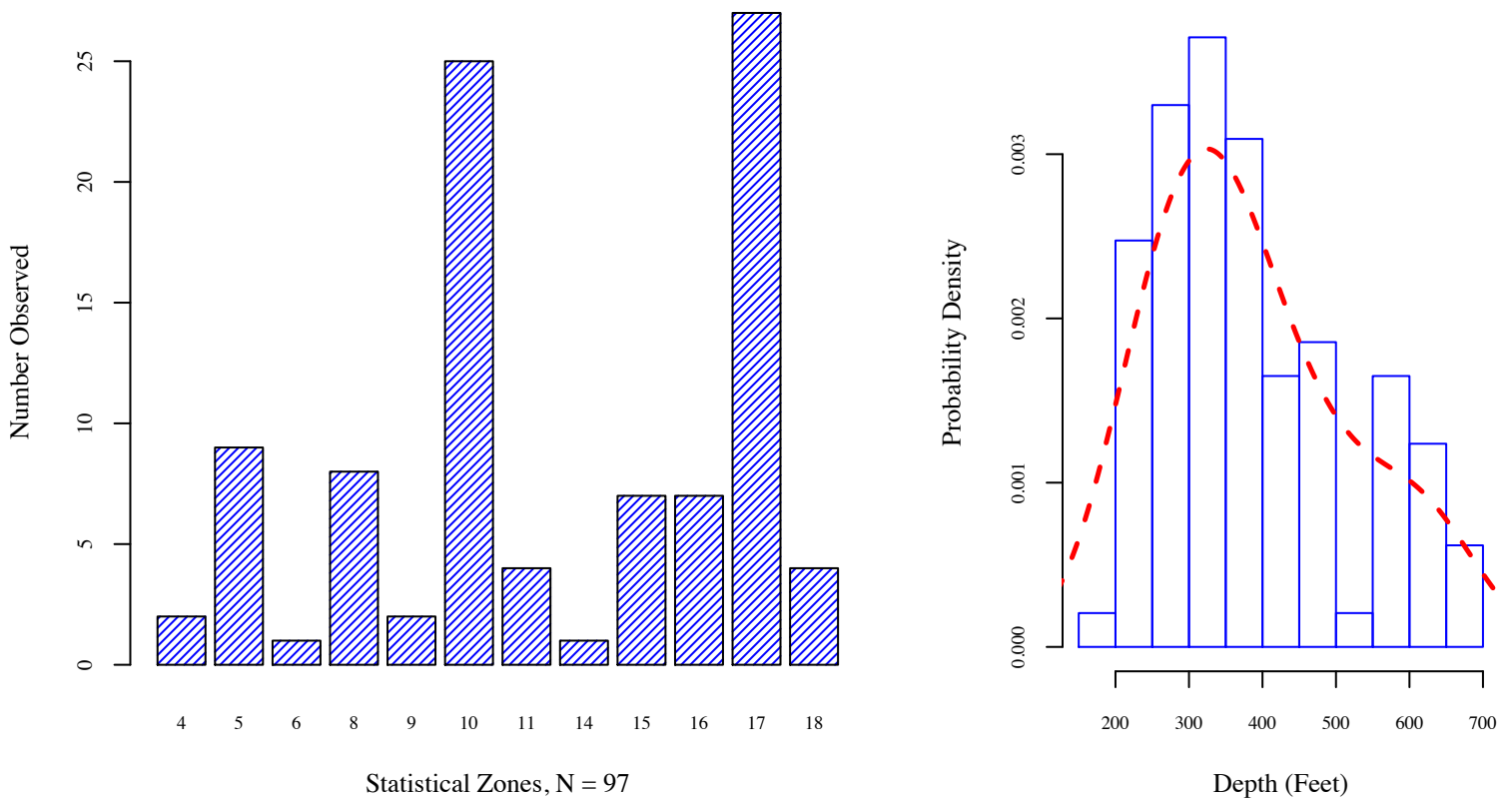


Figure 36 . Regression model, location, and depth information for tilefish, goldface (*Caulolatilus chrysops*).

Tilefish, Sand

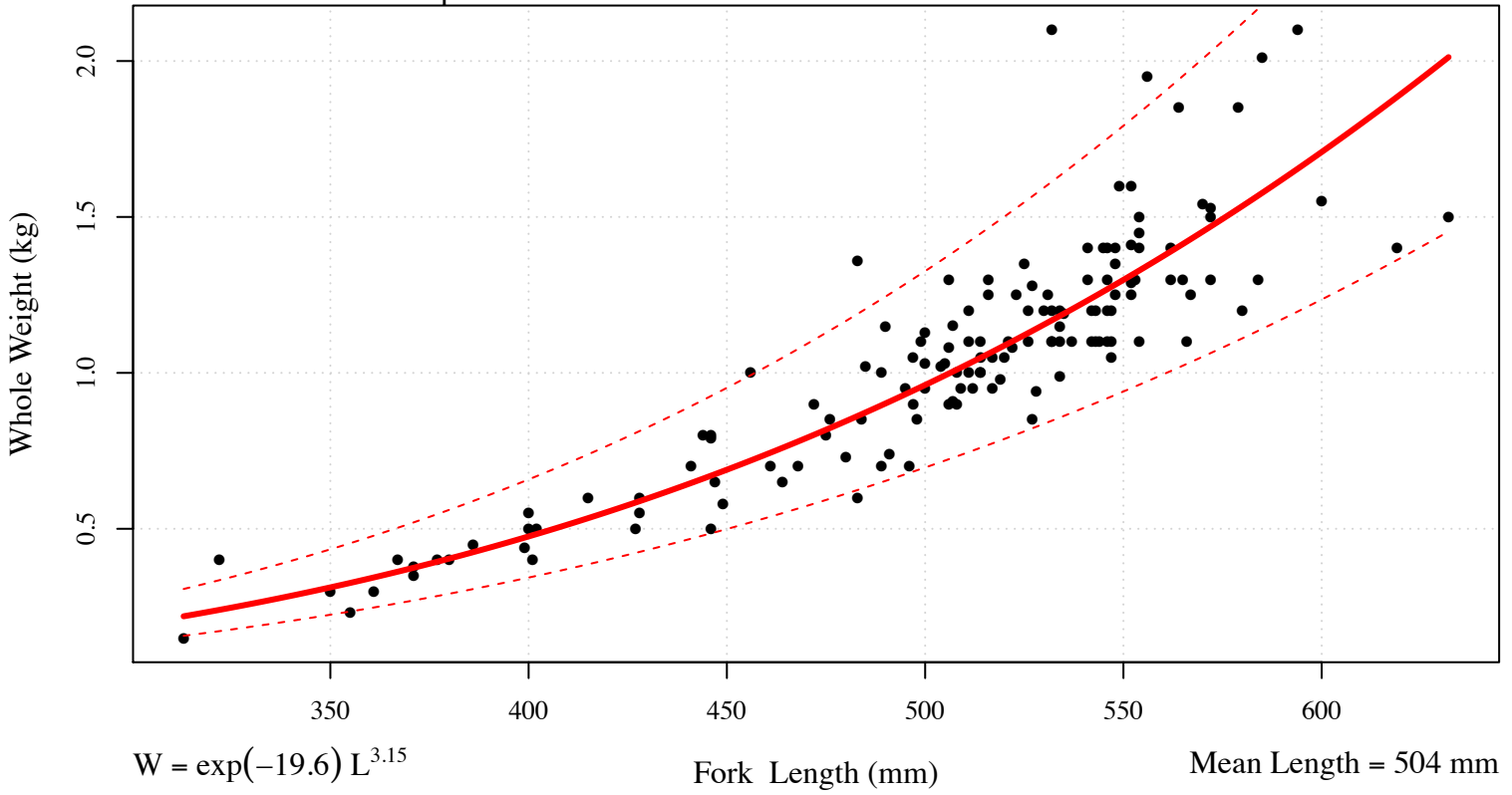
Malacanthus plumieri

$R^2 = 0.868$

N = 144

RSE = 0.162

Most common fate is kept



More common in the Eastern Gulf

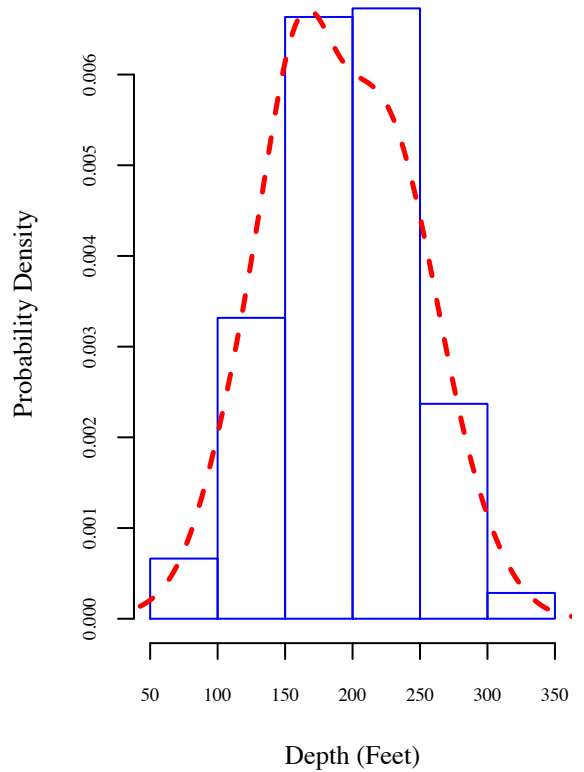
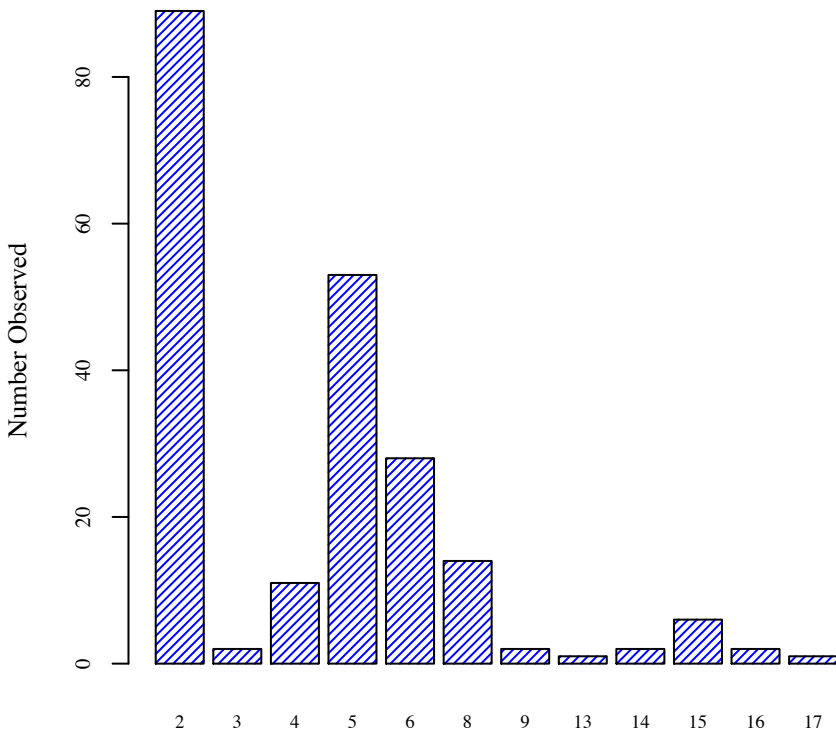
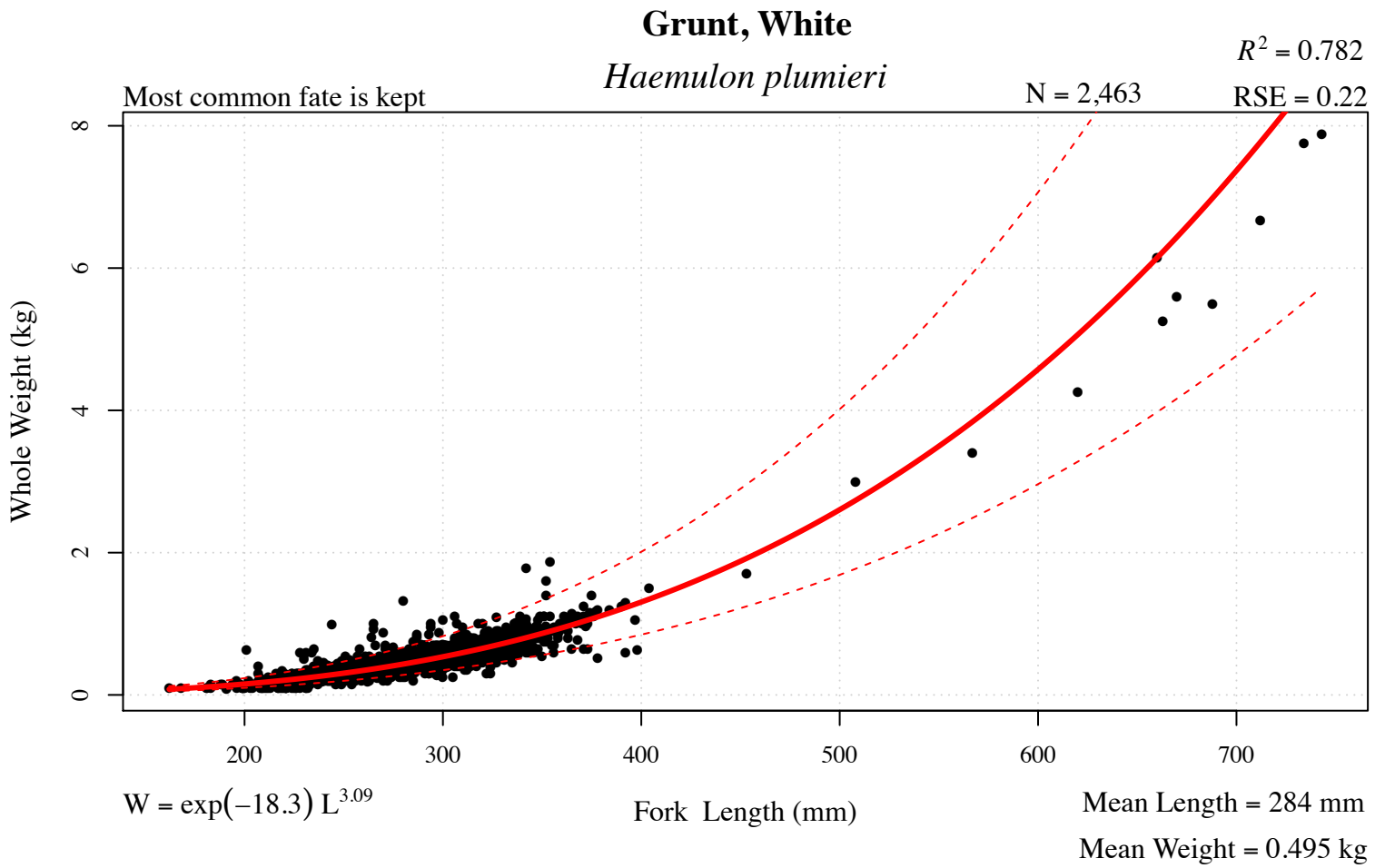


Figure 37 . Regression model, location, and depth information for tilefish, sand (*Malacanthus plumieri*).



More common in the Eastern Gulf

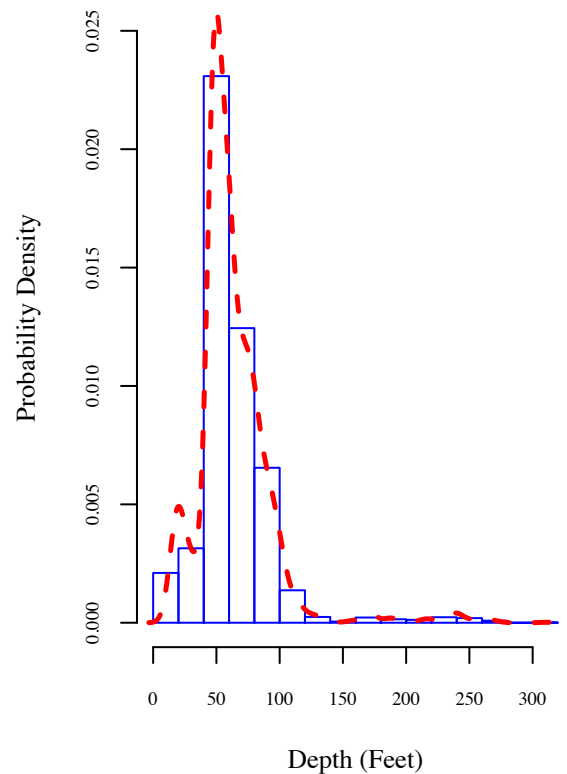
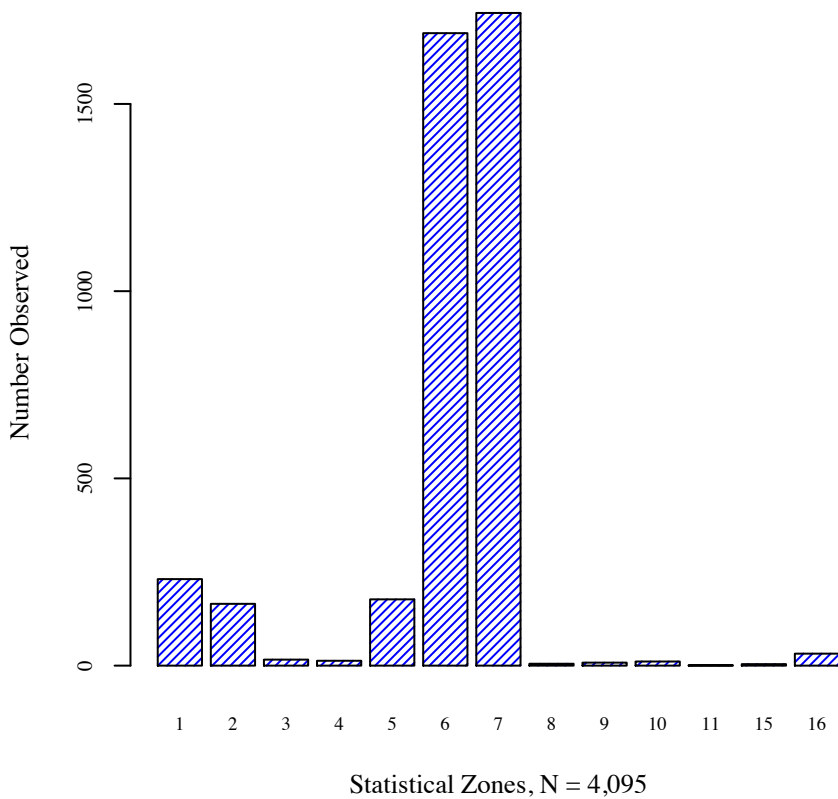
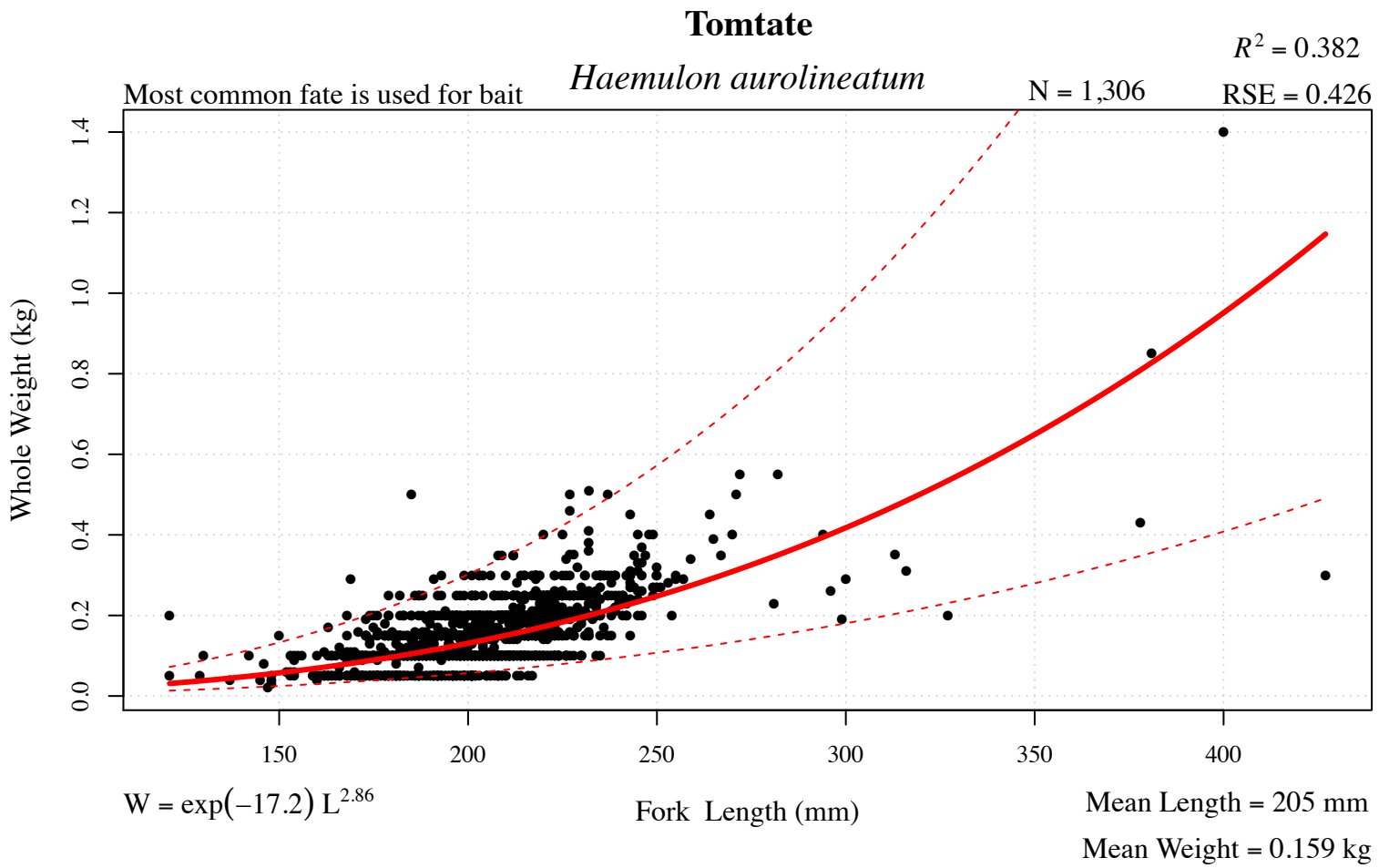


Figure 38 . Regression model, location, and depth information for grunt, white (*Haemulon plumieri*).



More common in the Eastern Gulf

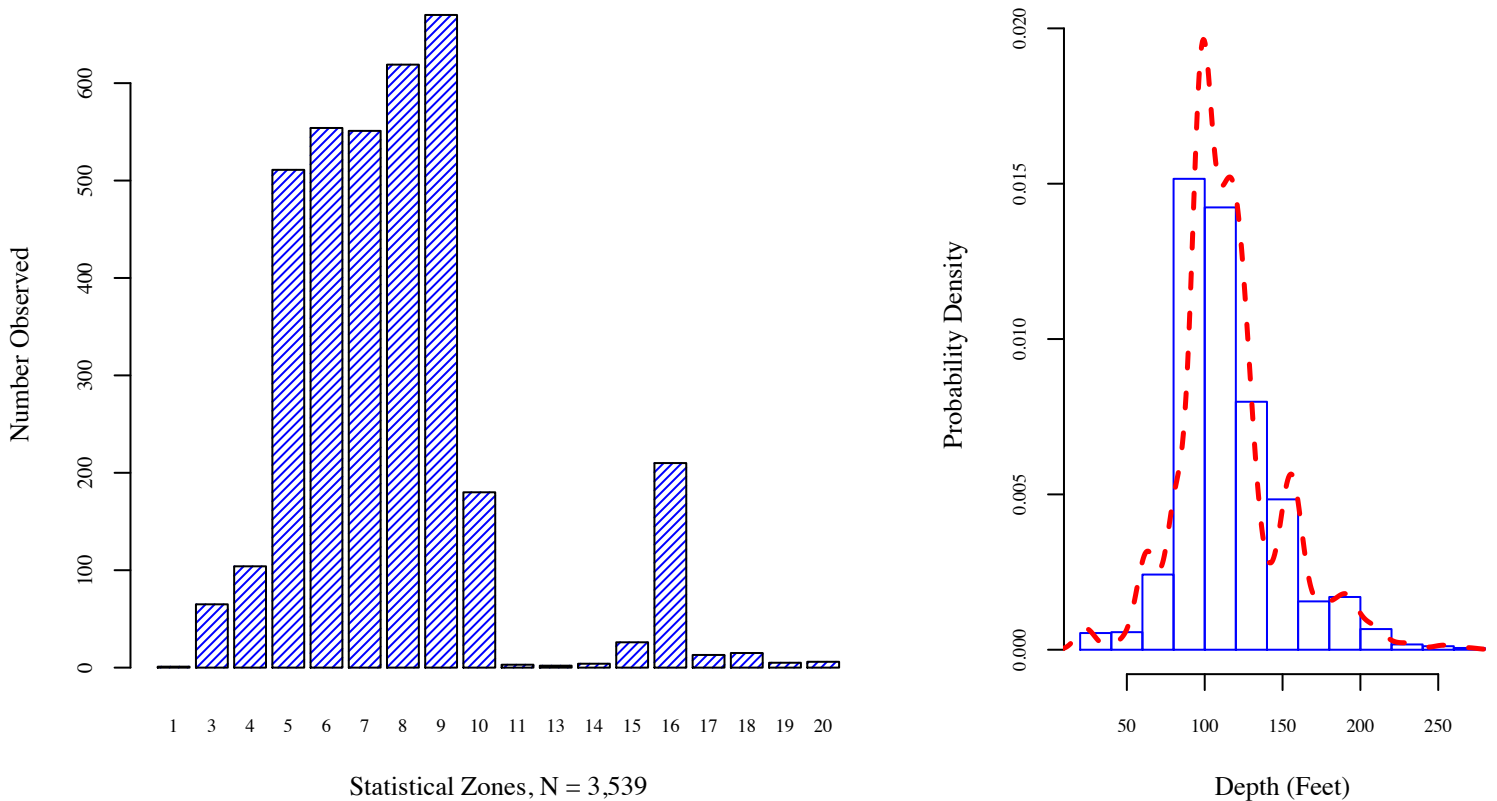
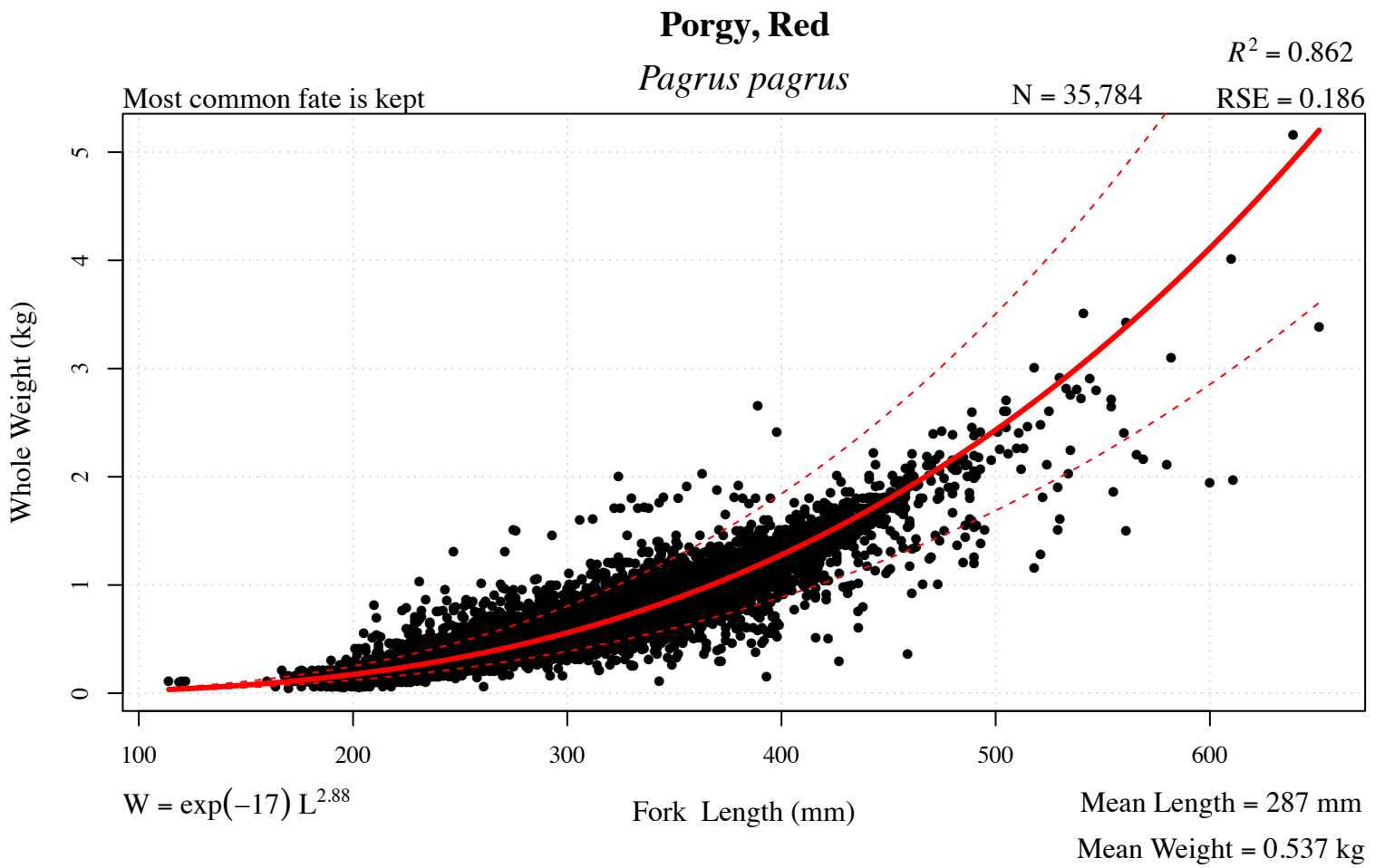


Figure 39 . Regression model, location, and depth information for tomtate (*Haemulon aurolineatum*).



More common in the Eastern Gulf

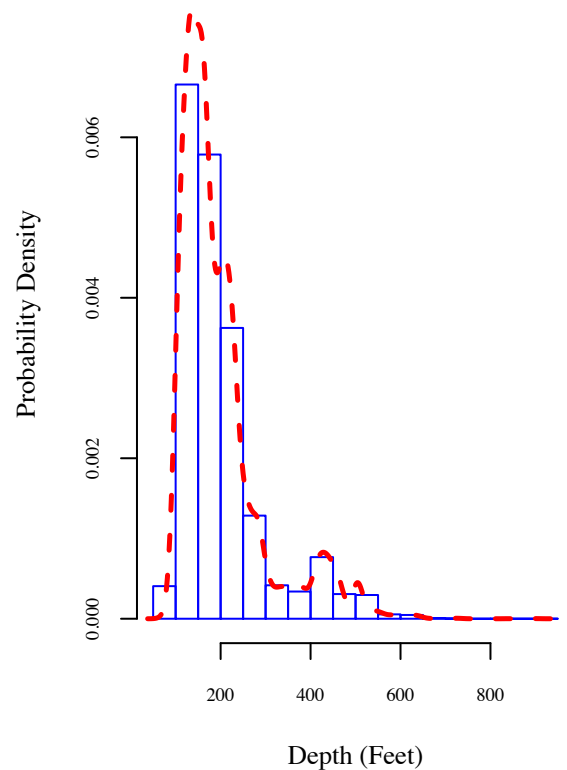
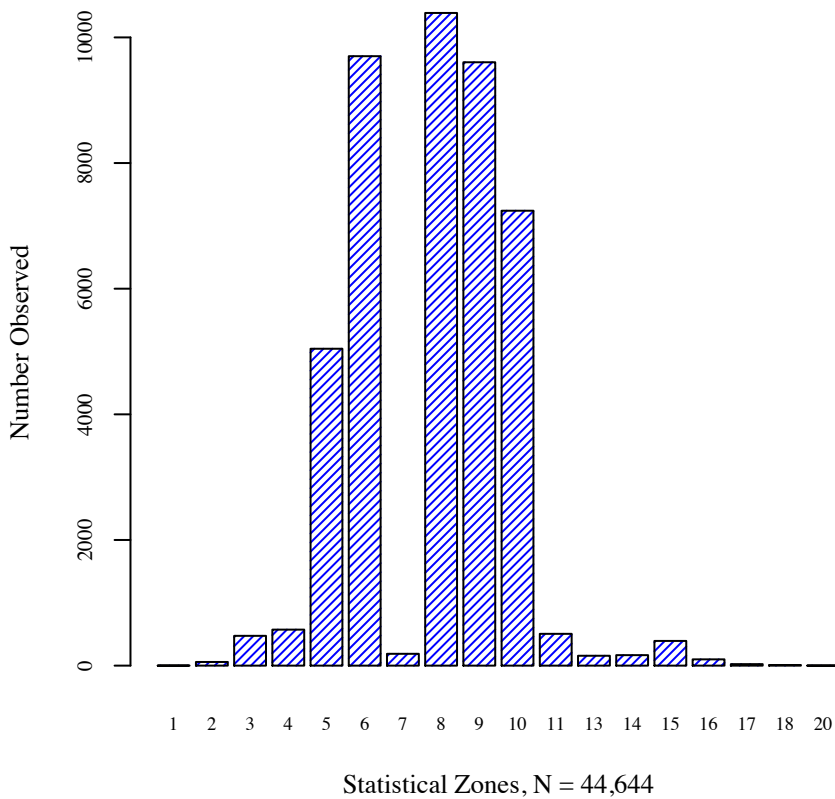


Figure 40 . Regression model, location, and depth information for porgy, red (*Pagrus pagrus*).

Porgy, Knobbed

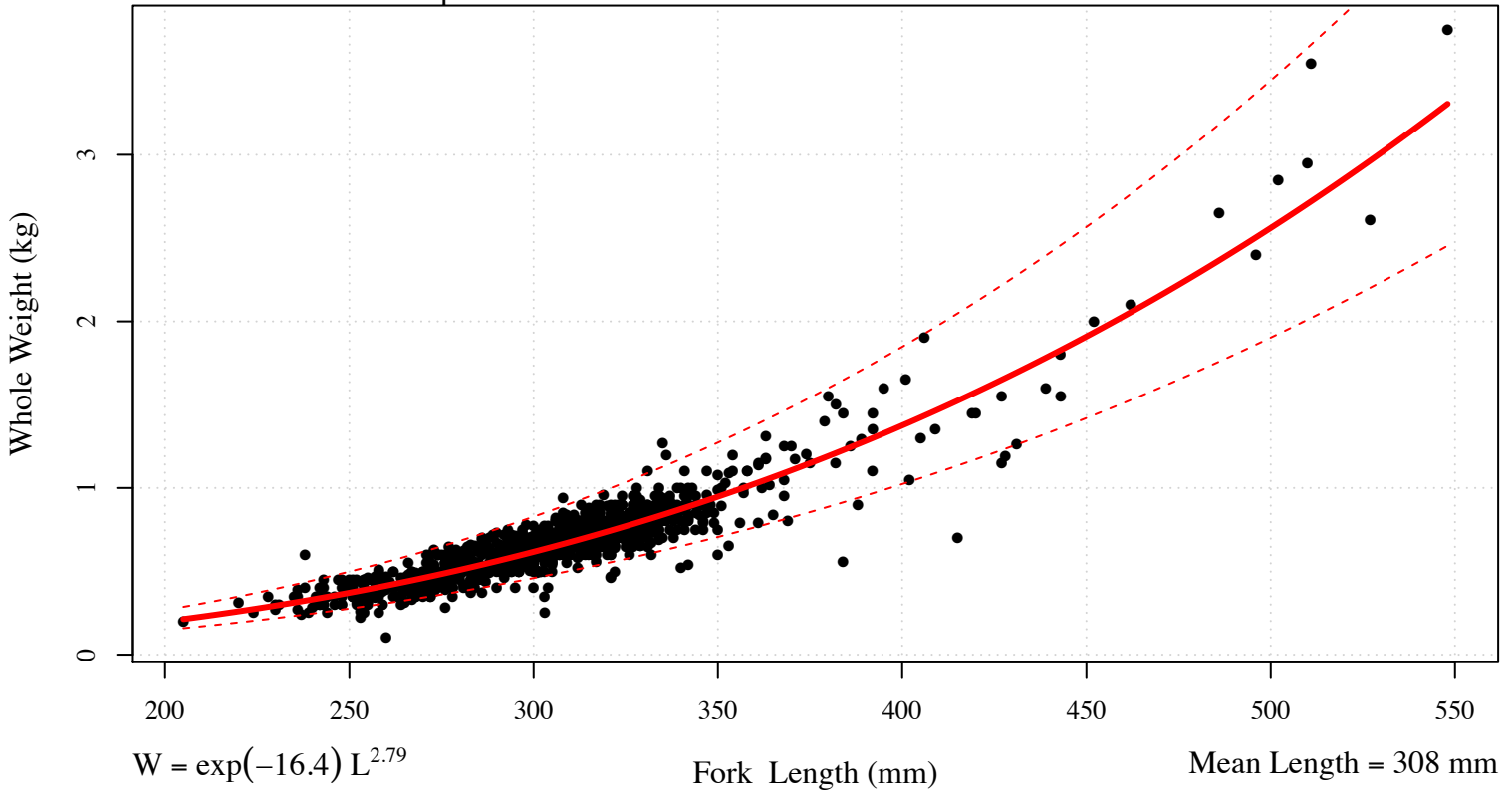
Calamus nodosus

$R^2 = 0.806$

N = 1,135

RSE = 0.15

Most common fate is kept



More common in the Eastern Gulf

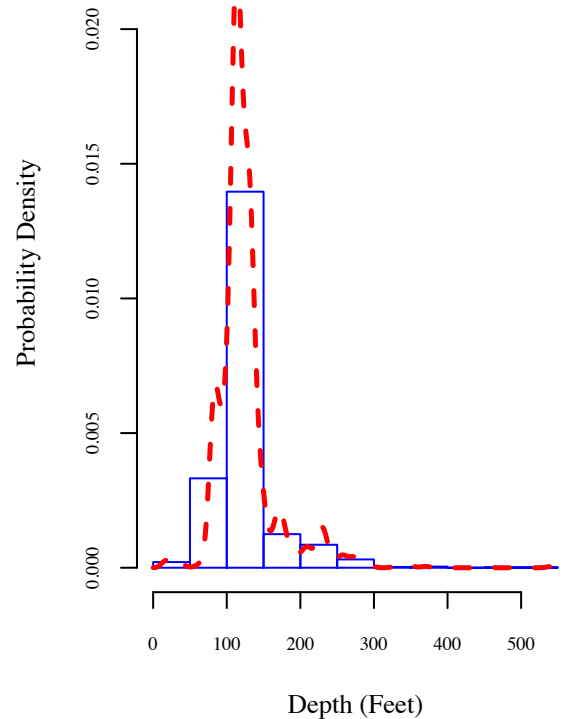
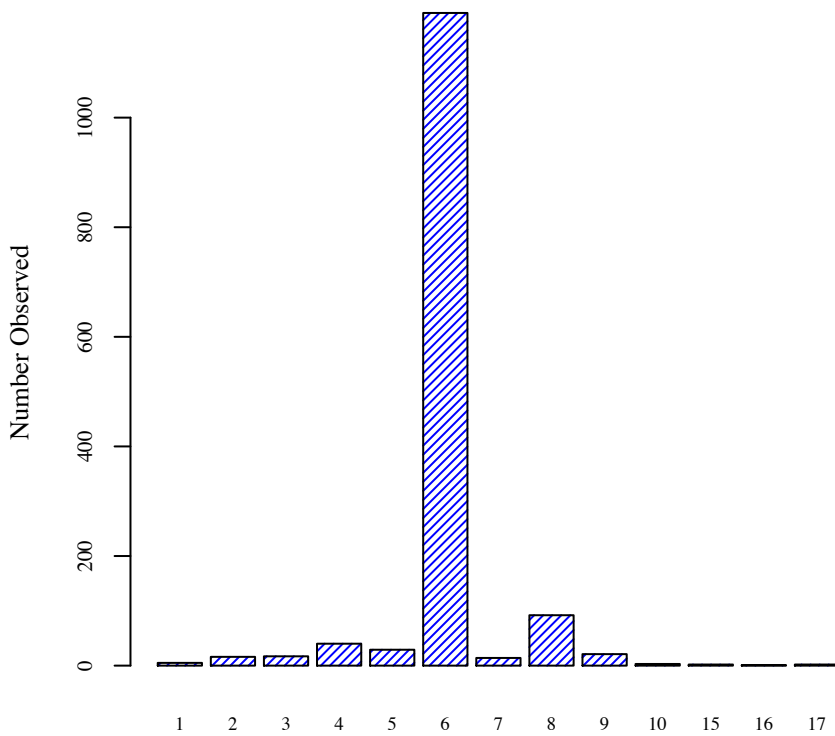


Figure 41 . Regression model, location, and depth information for porgy, knobbed (*Calamus nodosus*).

Porgy, Saucereye

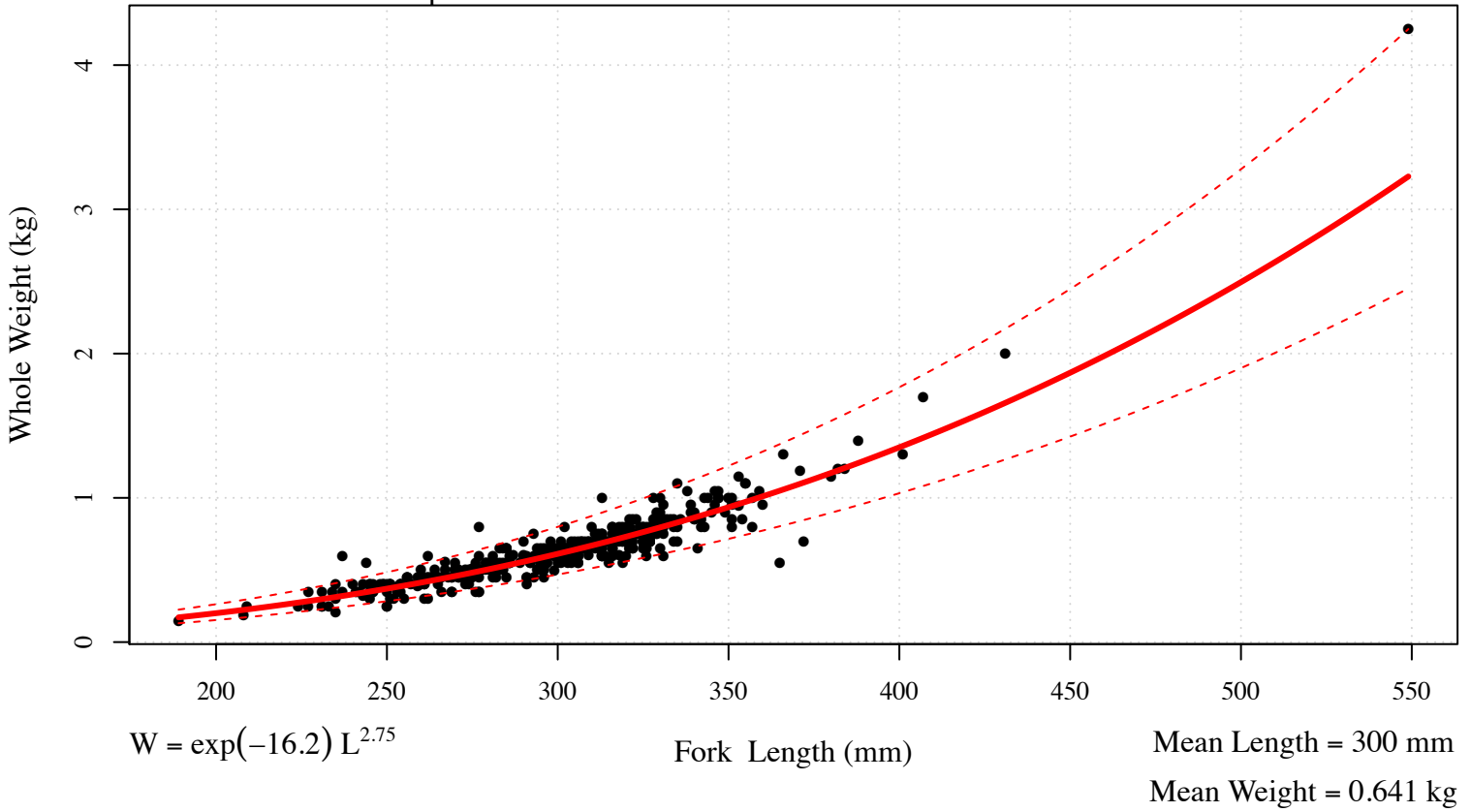
Calamus calamus

$R^2 = 0.858$

N = 414

RSE = 0.136

Most common fate is kept



More common in the Eastern Gulf

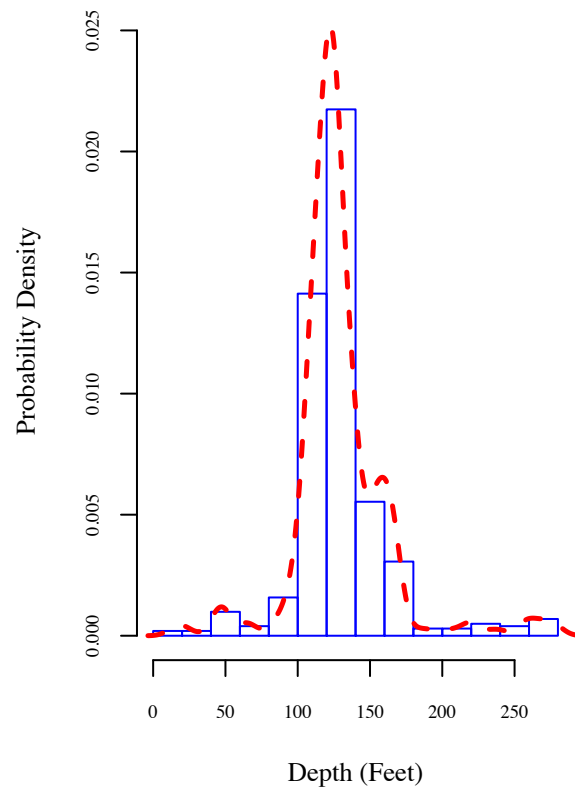
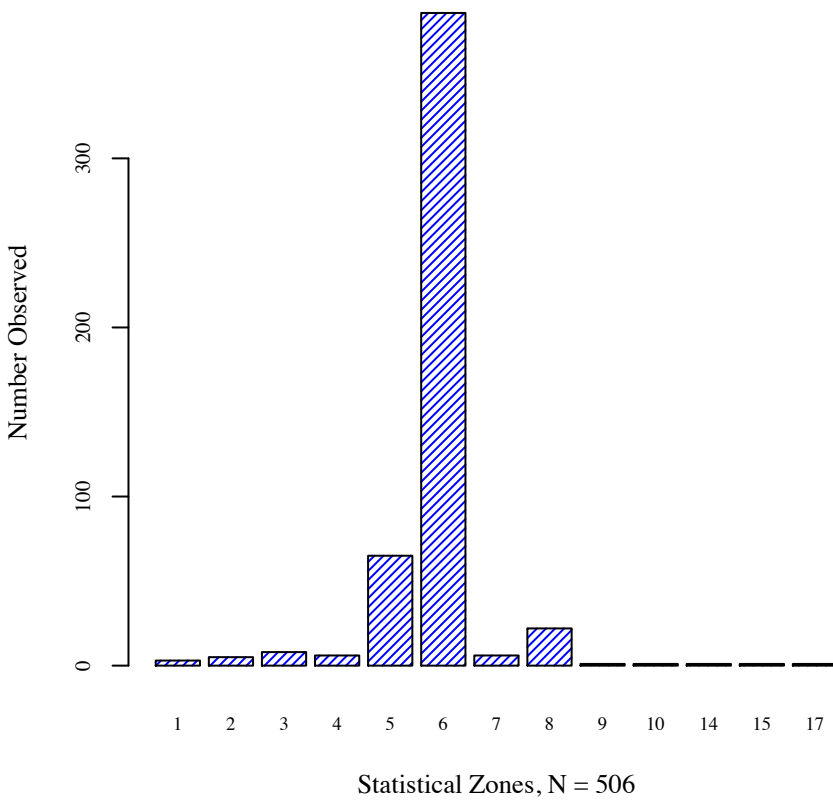
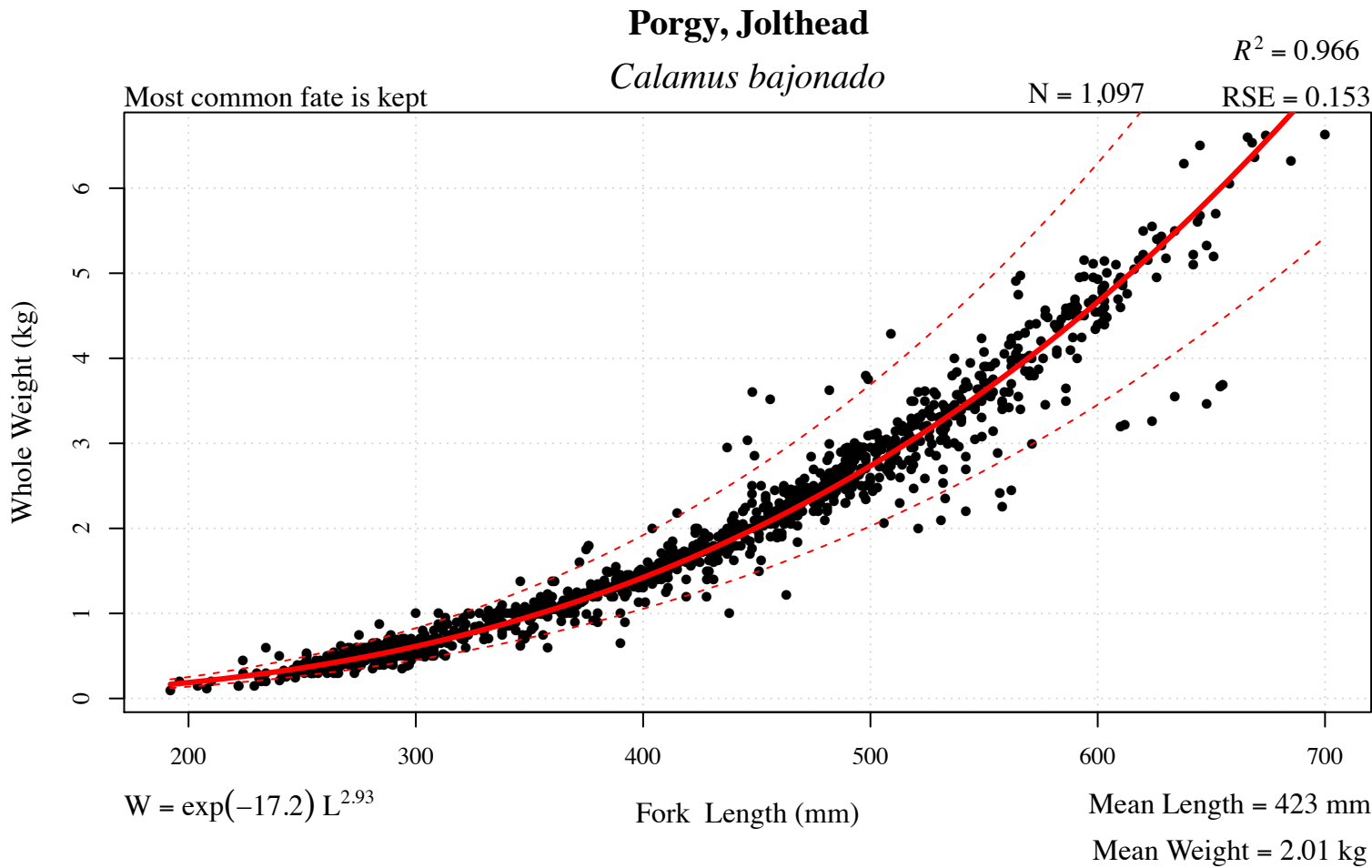


Figure 42 . Regression model, location, and depth information for porgy, saucereye (*Calamus calamus*).



More common in the Eastern Gulf

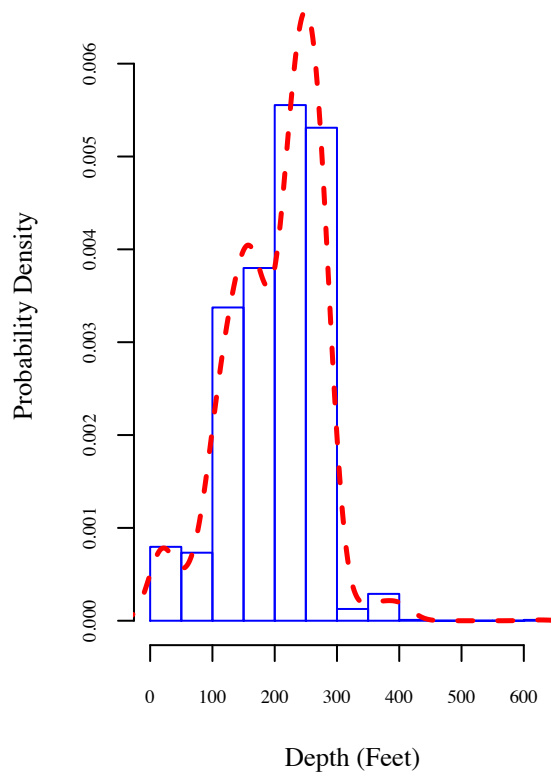
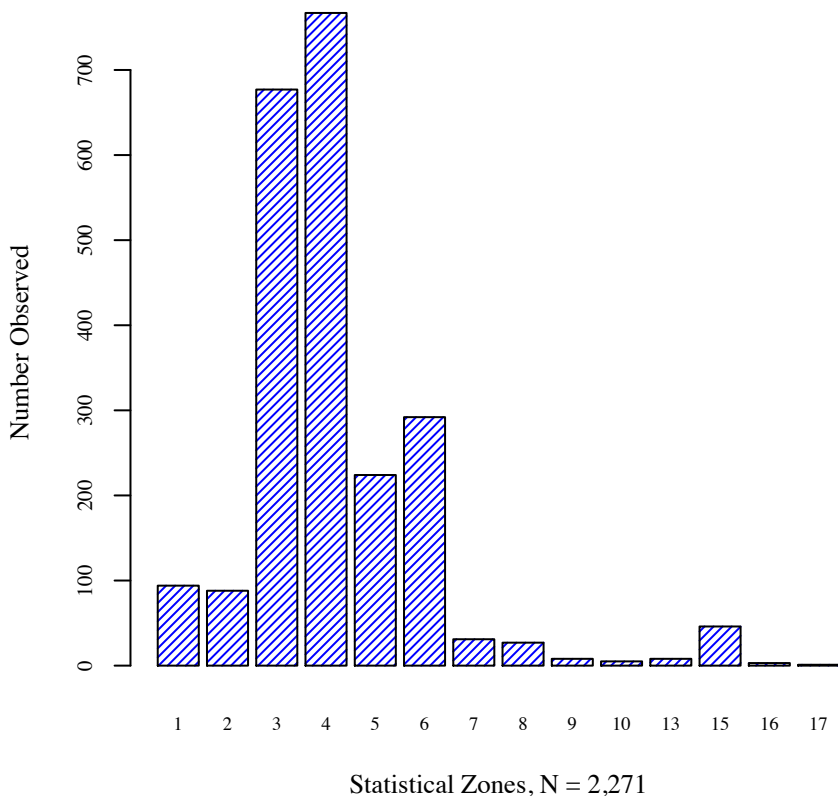


Figure 43 . Regression model, location, and depth information for porgy, jolthead (*Calamus bajonado*).

Porgy, Littlehead

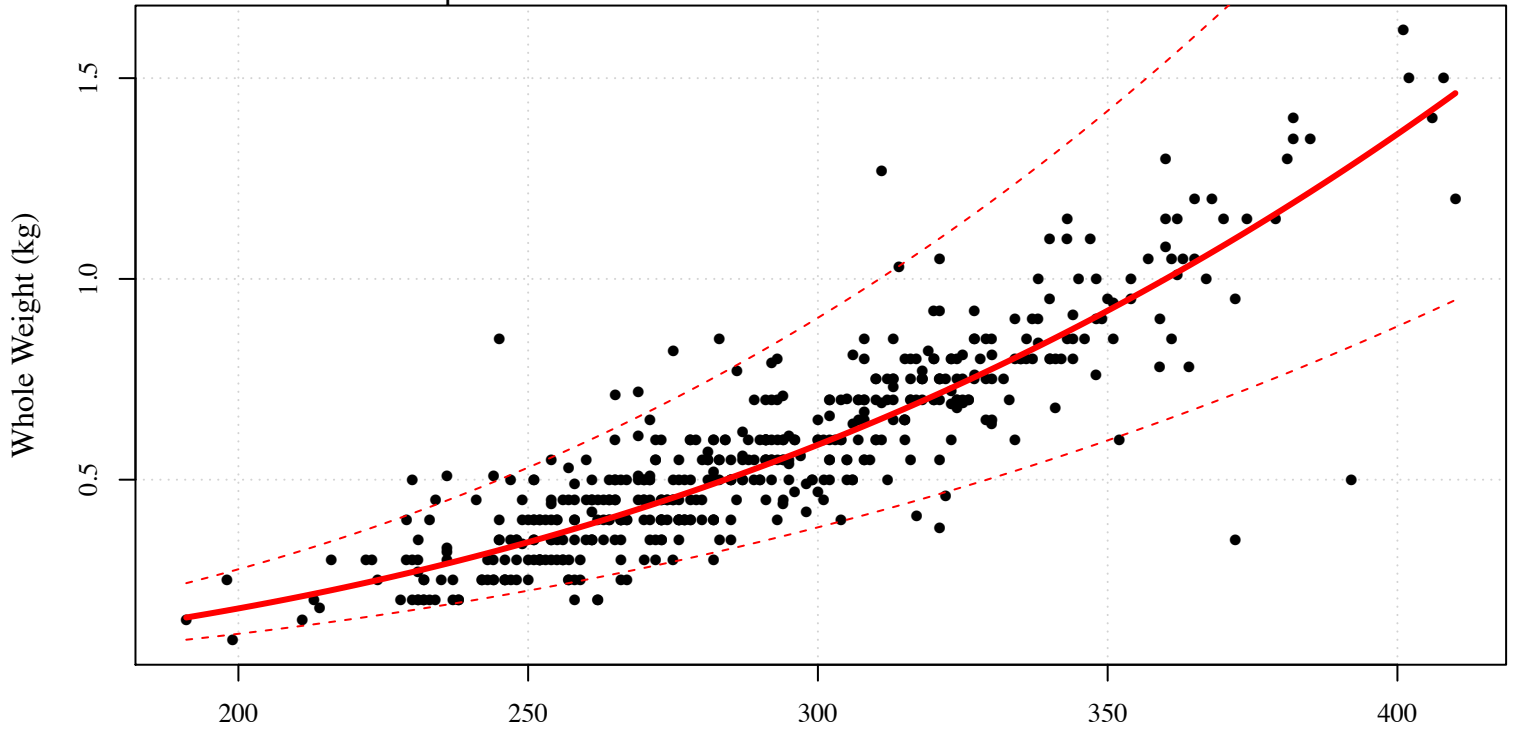
Calamus proridens

$R^2 = 0.758$

N = 490

RSE = 0.219

Most common fate is kept



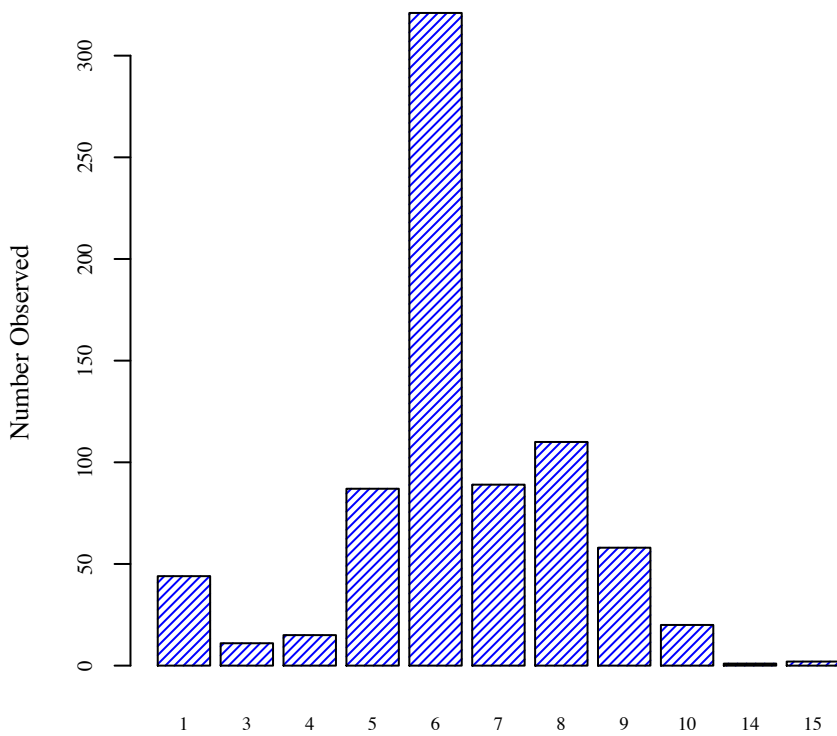
$$W = \exp(-17.2) L^{2.92}$$

Fork Length (mm)

Mean Length = 291 mm

Mean Weight = 0.573 kg

More common in the Eastern Gulf



Statistical Zones, N = 758

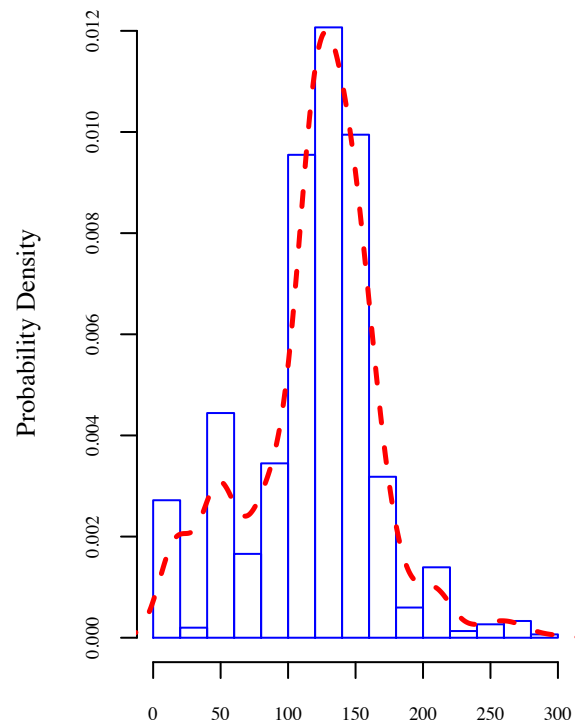


Figure 44 . Regression model, location, and depth information for porgy, littlehead (*Calamus proridens*).

Sheepshead

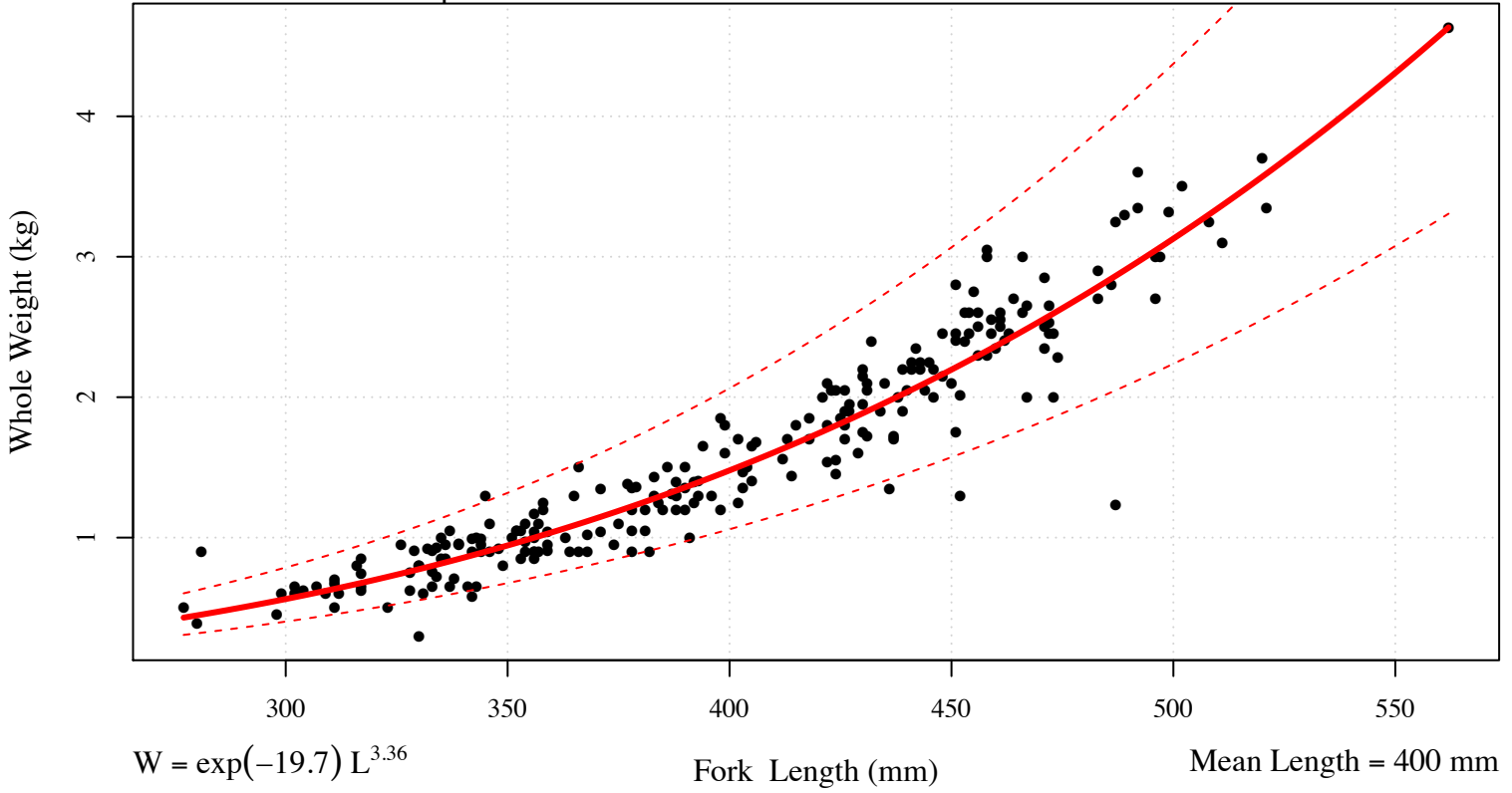
Archosargus probatocephalus

$R^2 = 0.893$

N = 238

RSE = 0.169

Most common fate is kept



More common in the Western Gulf

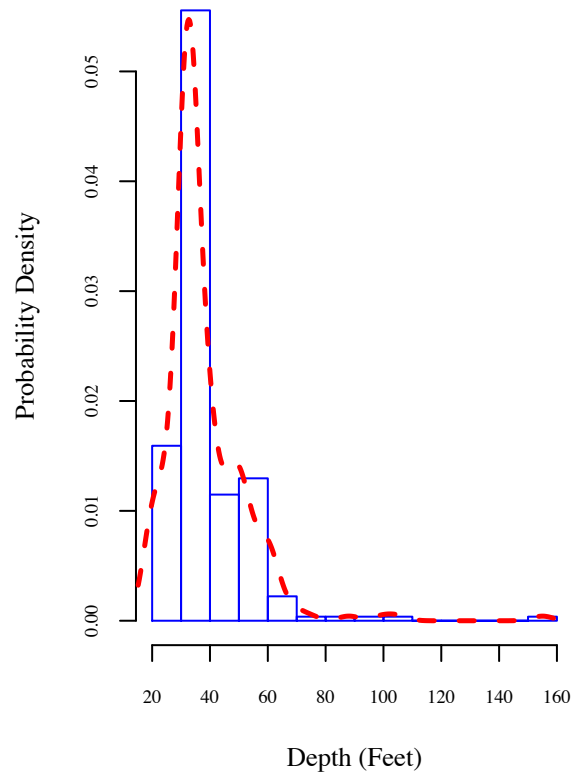
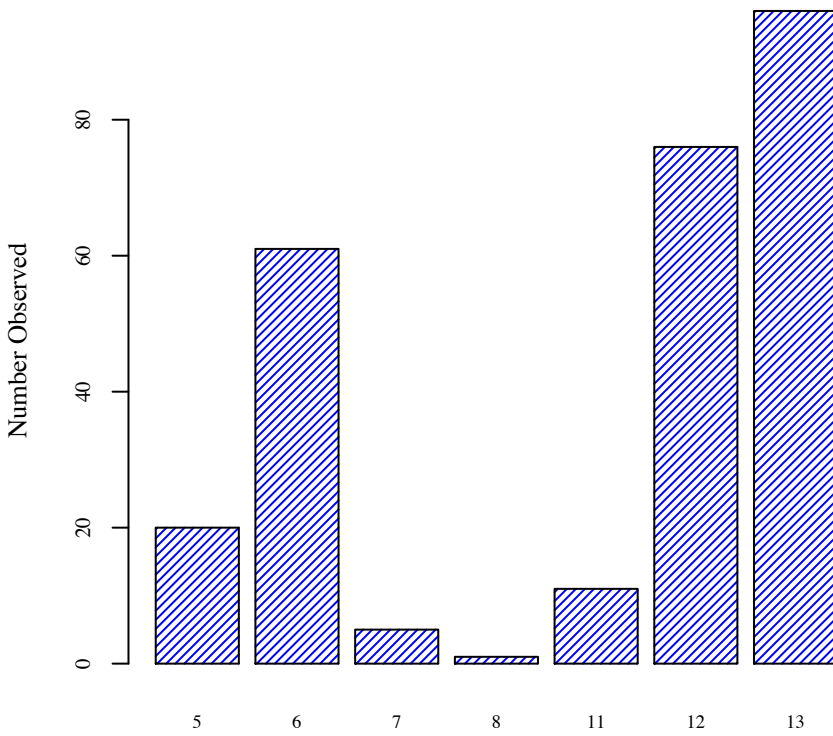


Figure 45 . Regression model, location, and depth information for sheepshead (*Archosargus probatocephalus*).

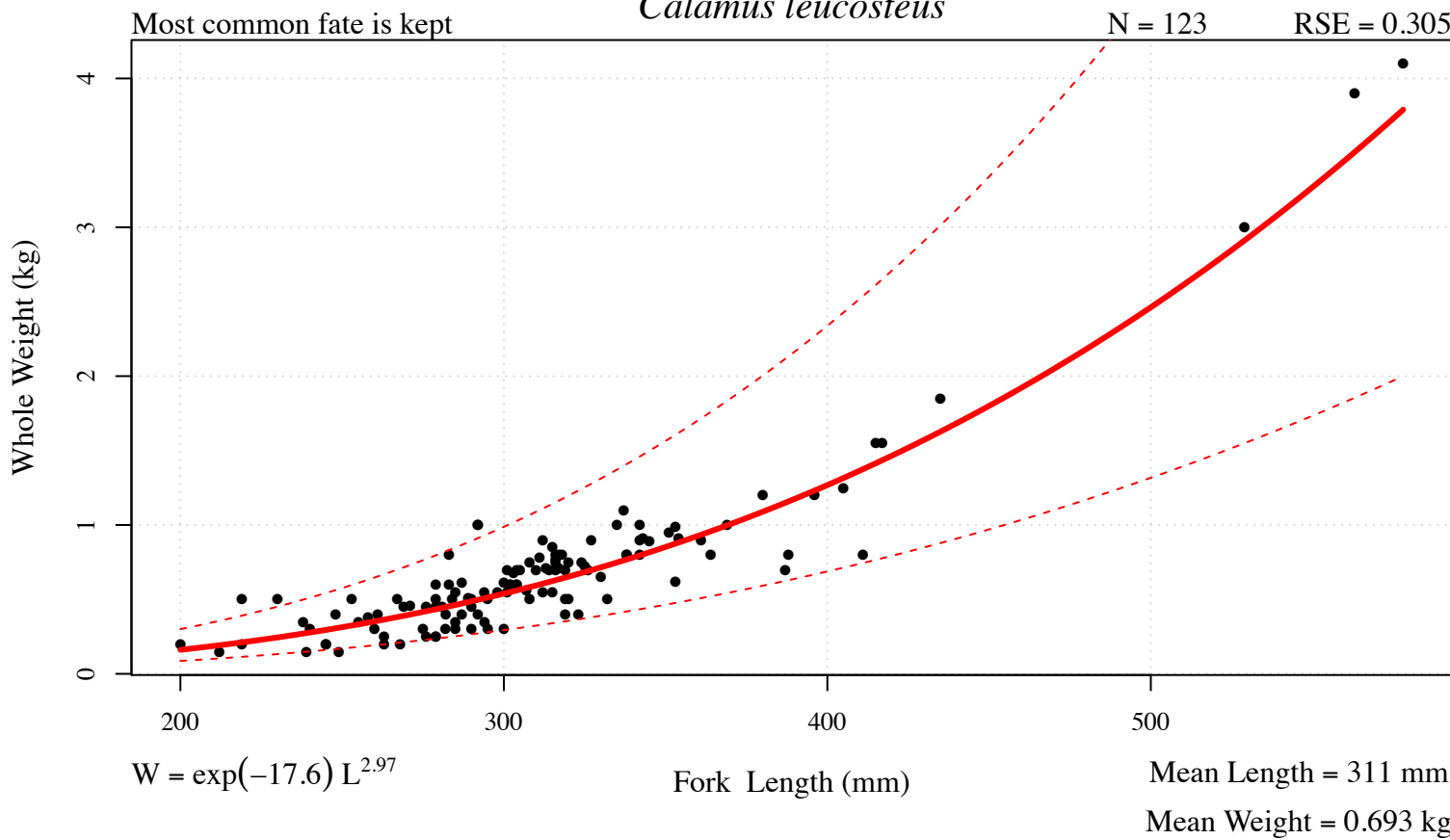
Porgy, Whitebone

Calamus leucosteus

$R^2 = 0.733$

RSE = 0.305

N = 123



More common in the Eastern Gulf

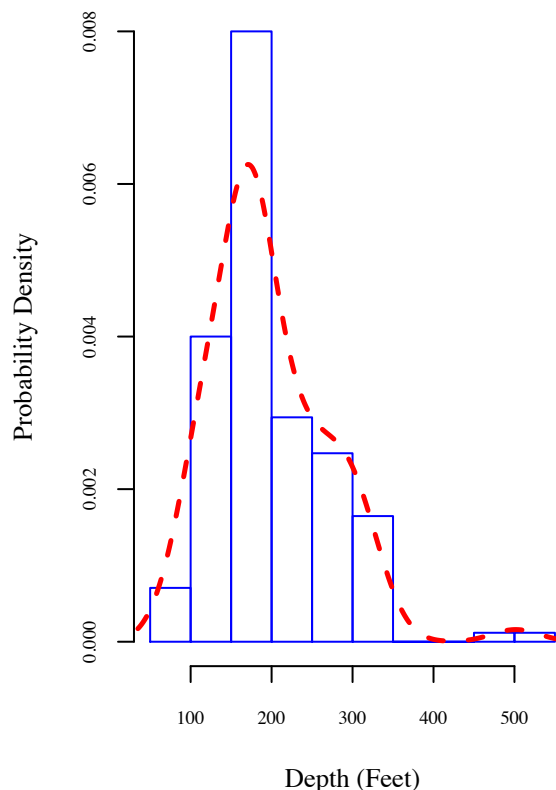
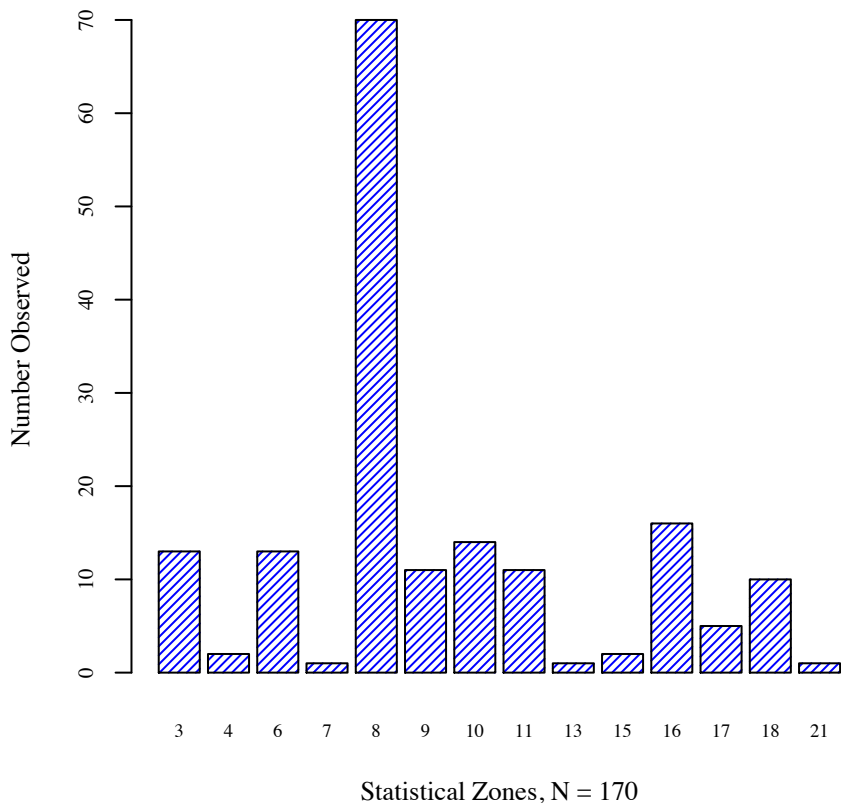


Figure 46 . Regression model, location, and depth information for porgy, whitebone (*Calamus leucosteus*).

Rudderfish, Banded

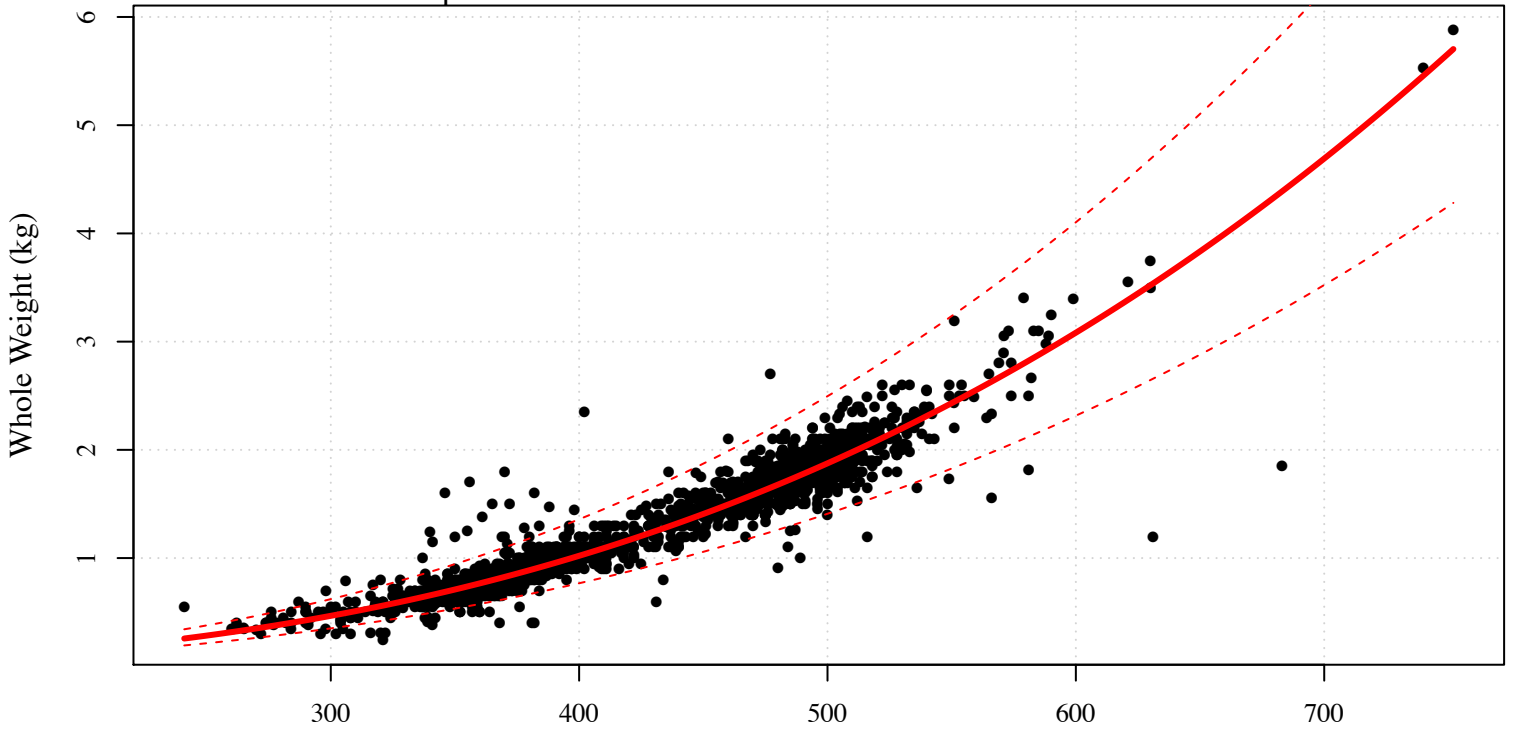
Seriola zonata

$R^2 = 0.909$

N = 1,657

RSE = 0.146

Most common fate is kept



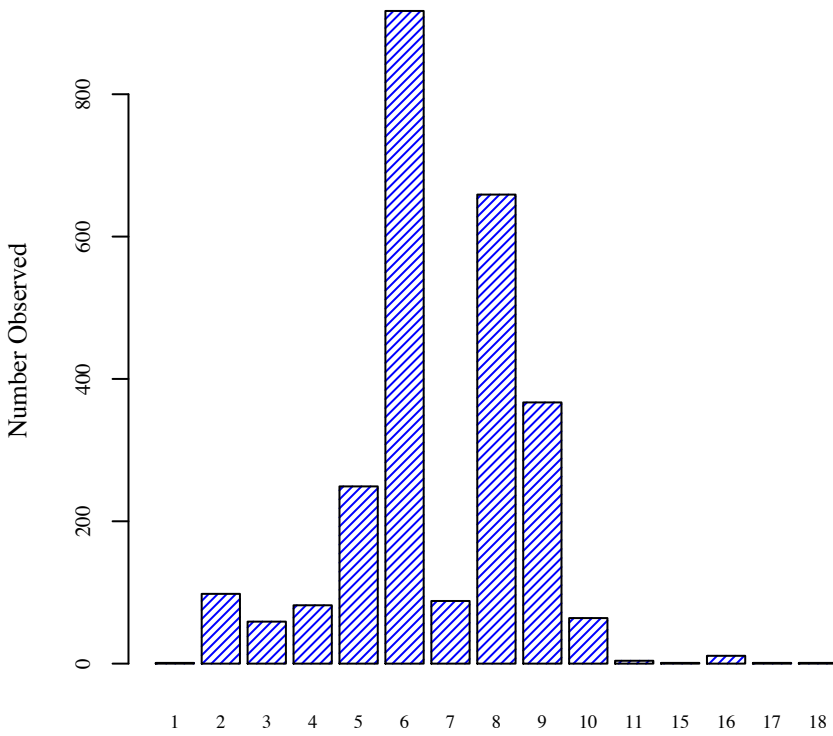
$$W = \exp(-16.3) L^{2.72}$$

Fork Length (mm)

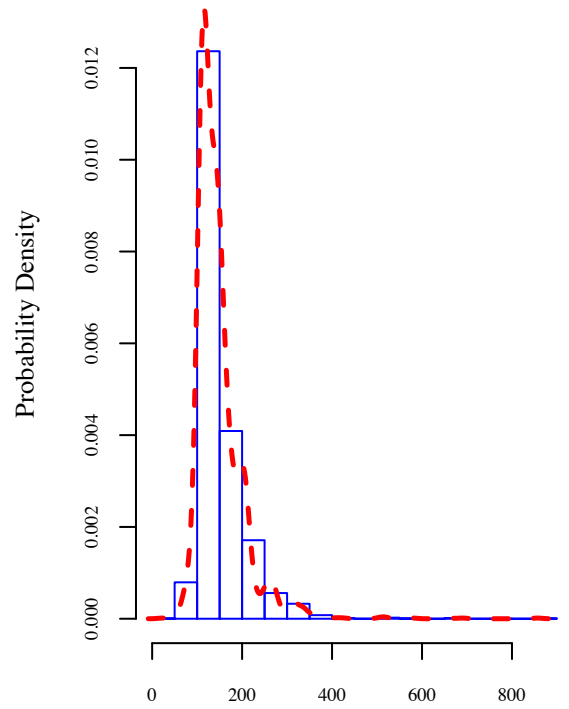
Mean Length = 427 mm

Mean Weight = 1.31 kg

More common in the Eastern Gulf



Statistical Zones, N = 2,603



Depth (Feet)

Figure 47 . Regression model, location, and depth information for rudderfish, banded (*Seriola zonata*).

Amberjack, Lesser

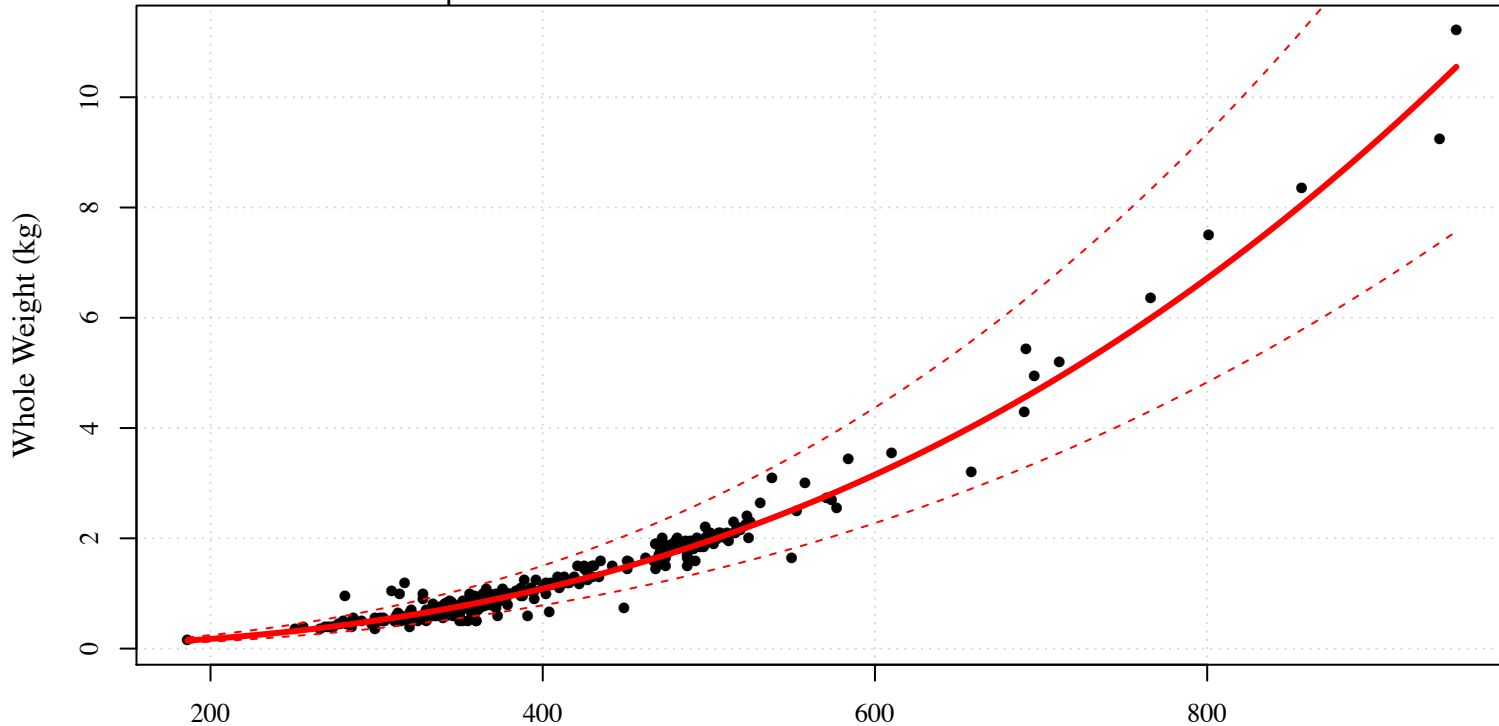
Seriola fasciata

$R^2 = 0.932$

N = 286

RSE = 0.165

Most common fate is kept



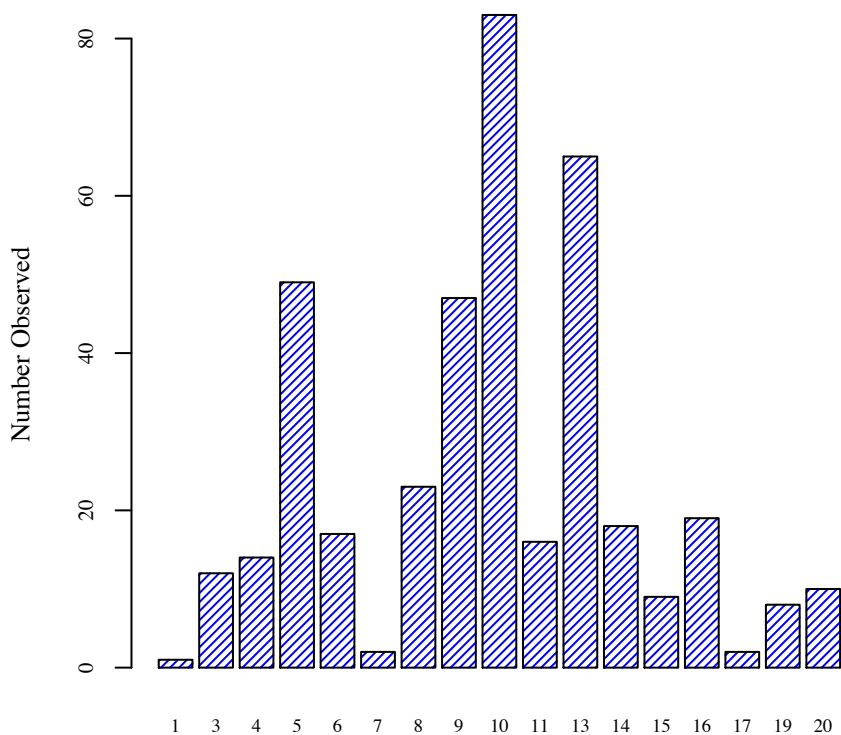
$$W = \exp(-15.7) L^{2.63}$$

Fork Length (mm)

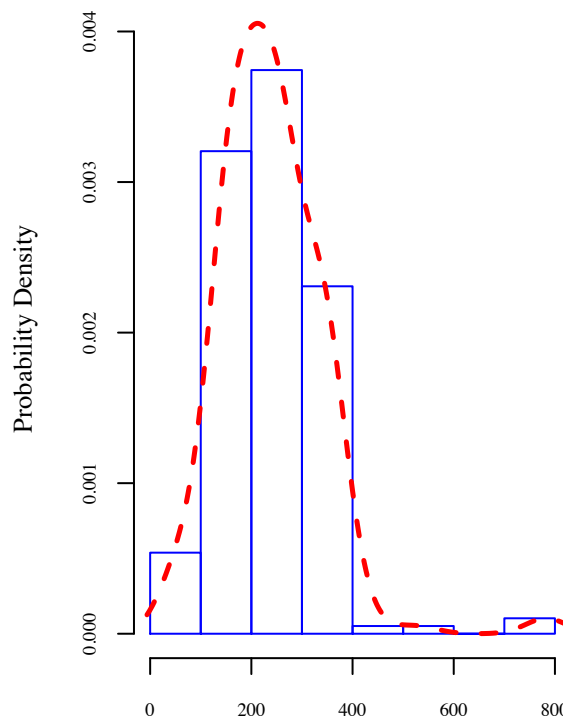
Mean Length = 410 mm

Mean Weight = 1.36 kg

More common in the Eastern Gulf



Statistical Zones, N = 395



Depth (Feet)

Figure 48 . Regression model, location, and depth information for amberjack, lesser (*Seriola fasciata*).

Amberjack, Greater

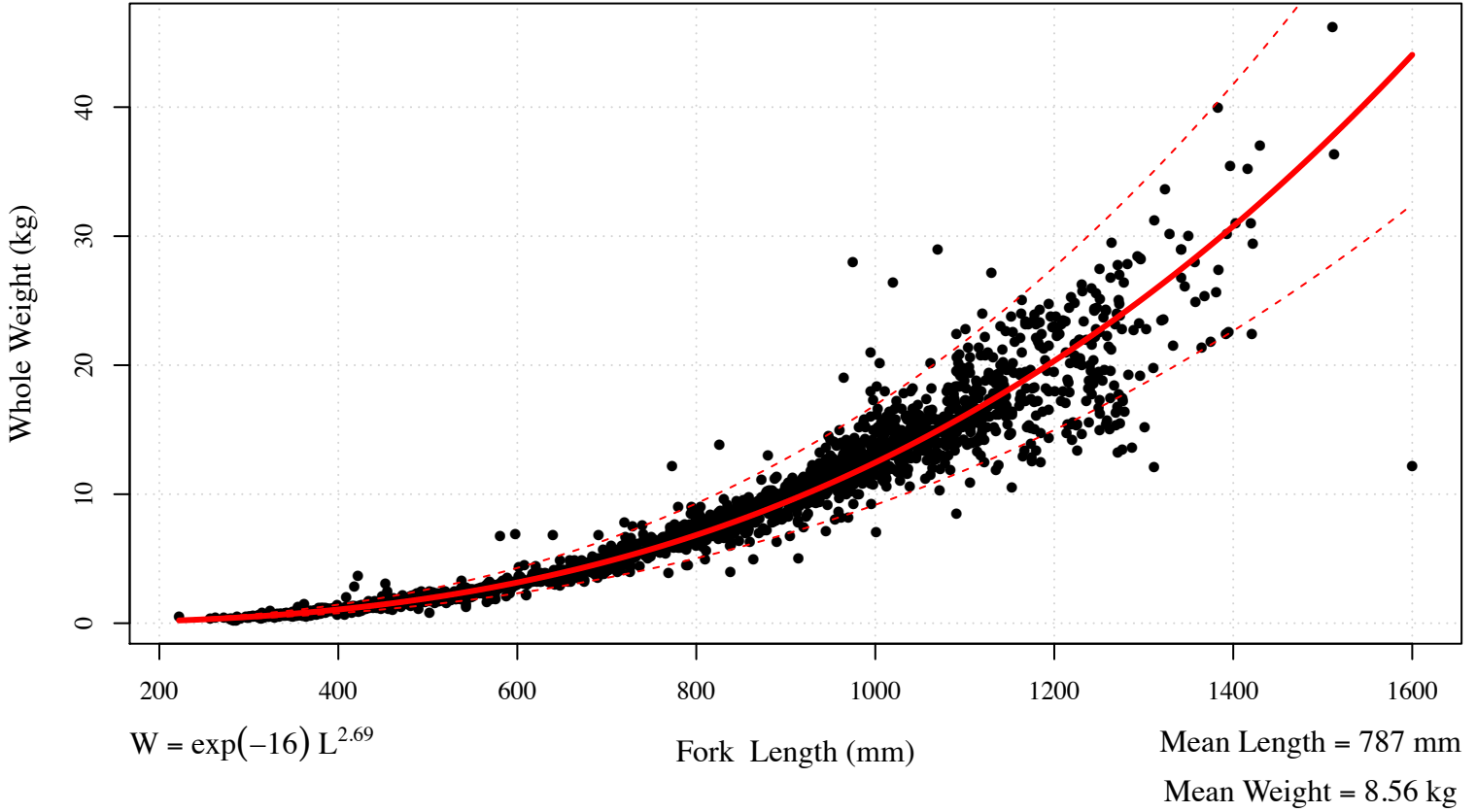
Seriola dumerili

$R^2 = 0.981$

N = 2,323

RSE = 0.156

Most common fate is discarded alive



More common in the Eastern Gulf

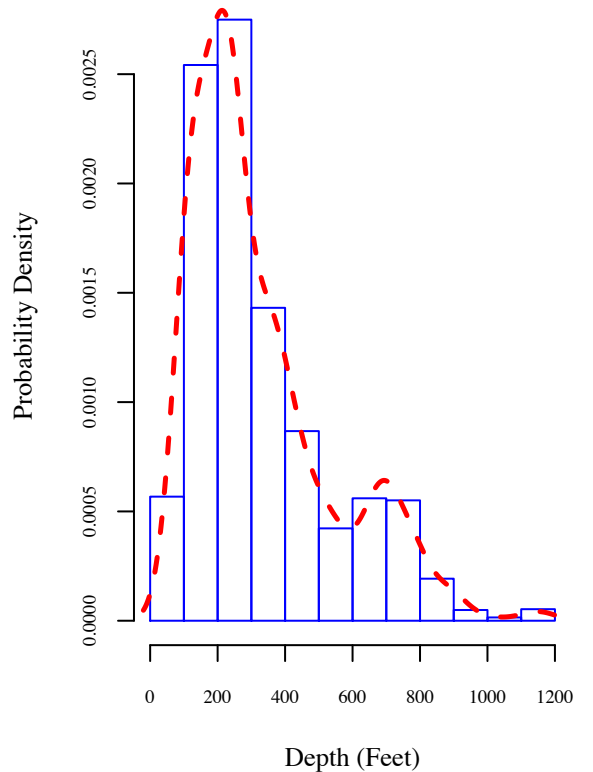
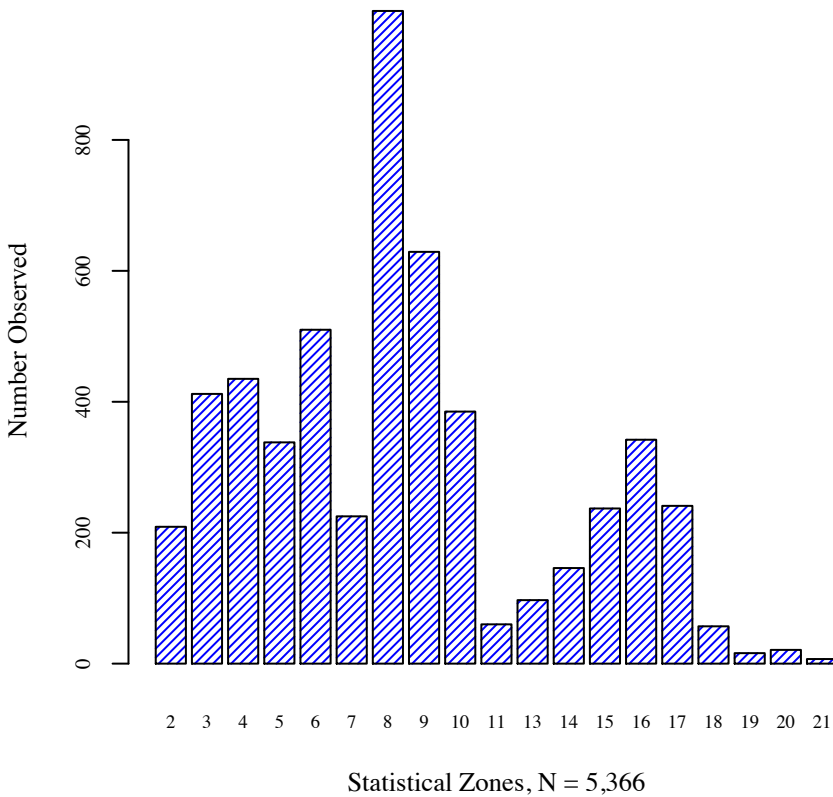
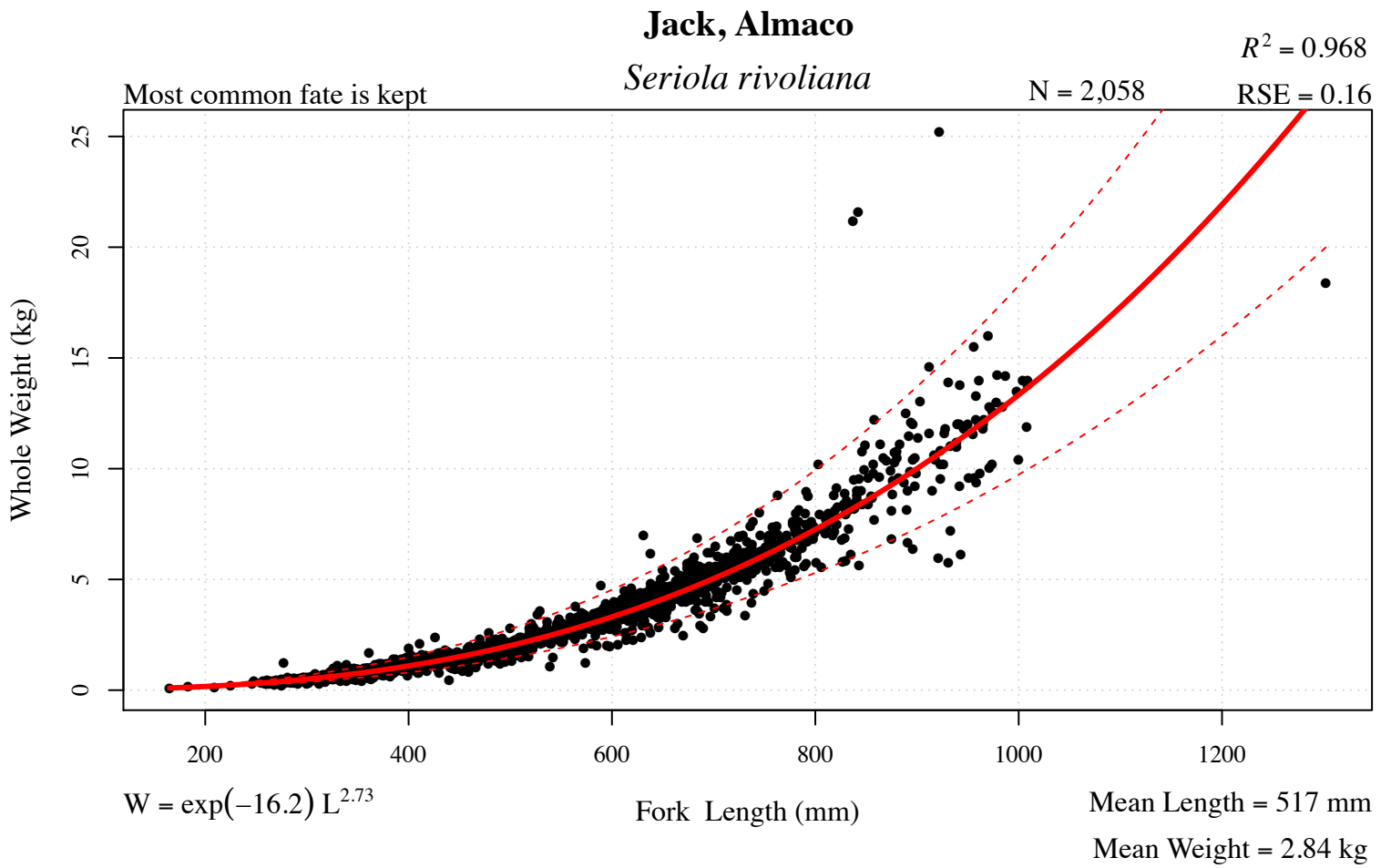


Figure 49 . Regression model, location, and depth information for amberjack, greater (*Seriola dumerili*).



More common in the Eastern Gulf

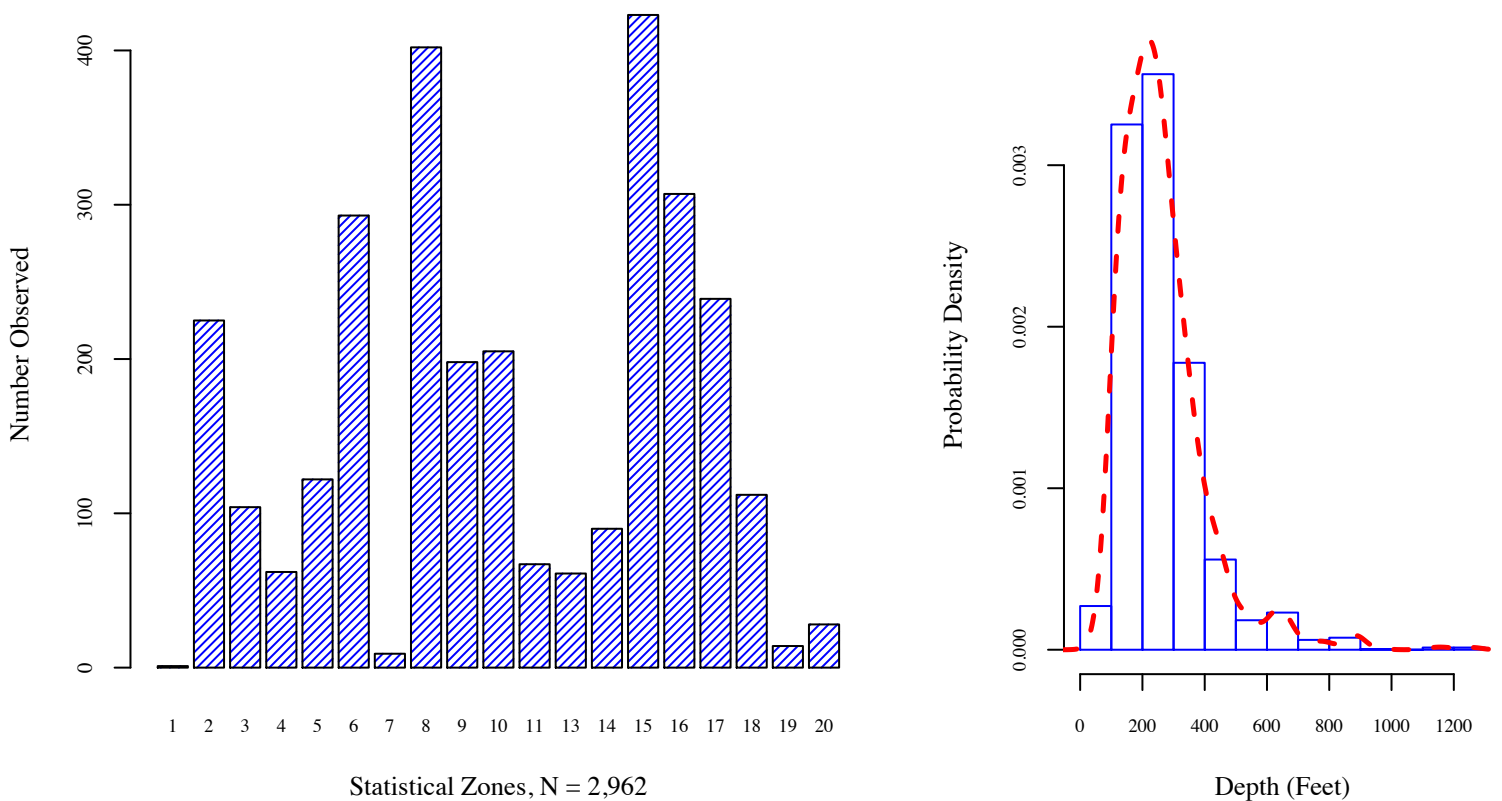


Figure 50 . Regression model, location, and depth information for jack, almaco (*Seriola rivoliana*).

Runner, Blue

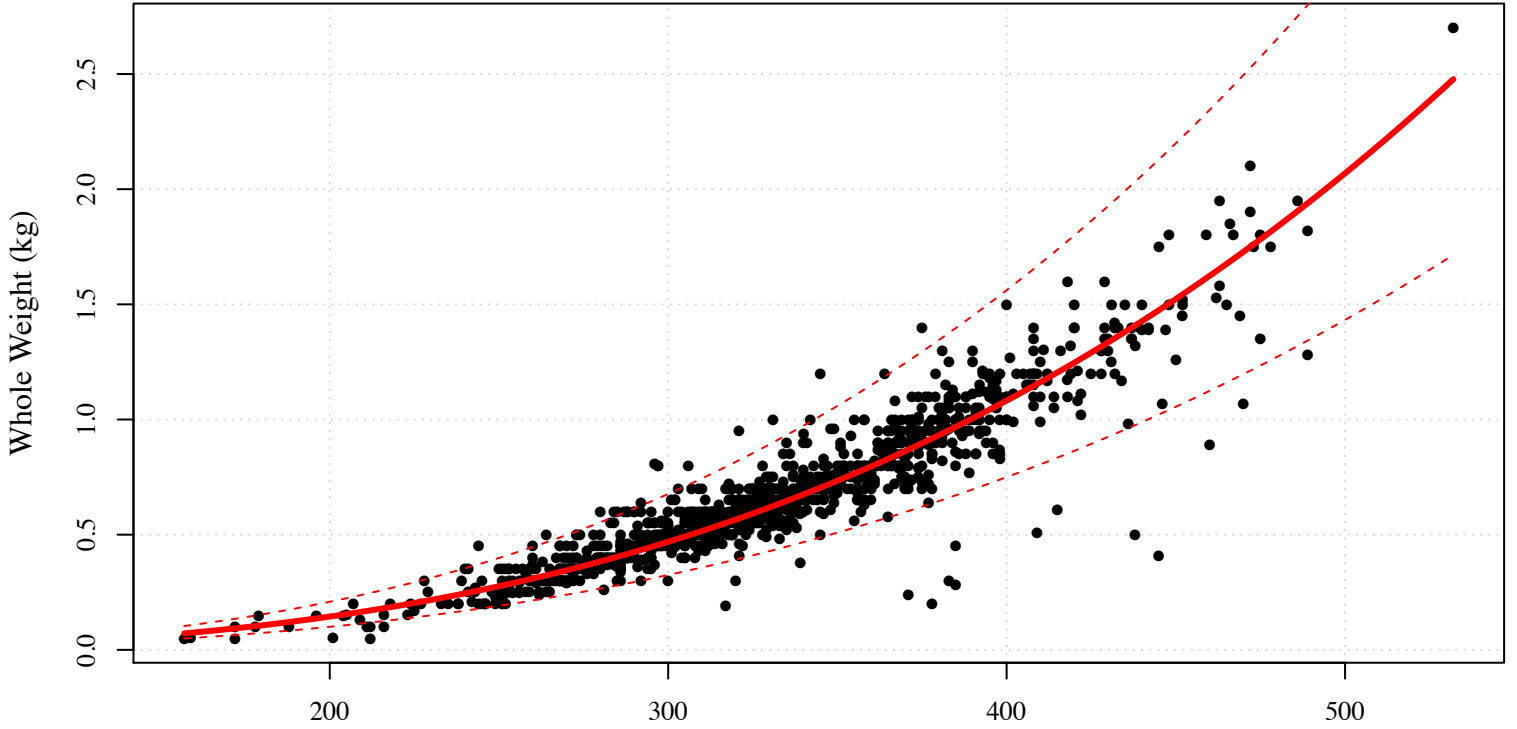
Caranx crysos

$R^2 = 0.866$

N = 1,165

RSE = 0.187

Most common fate is used for bait



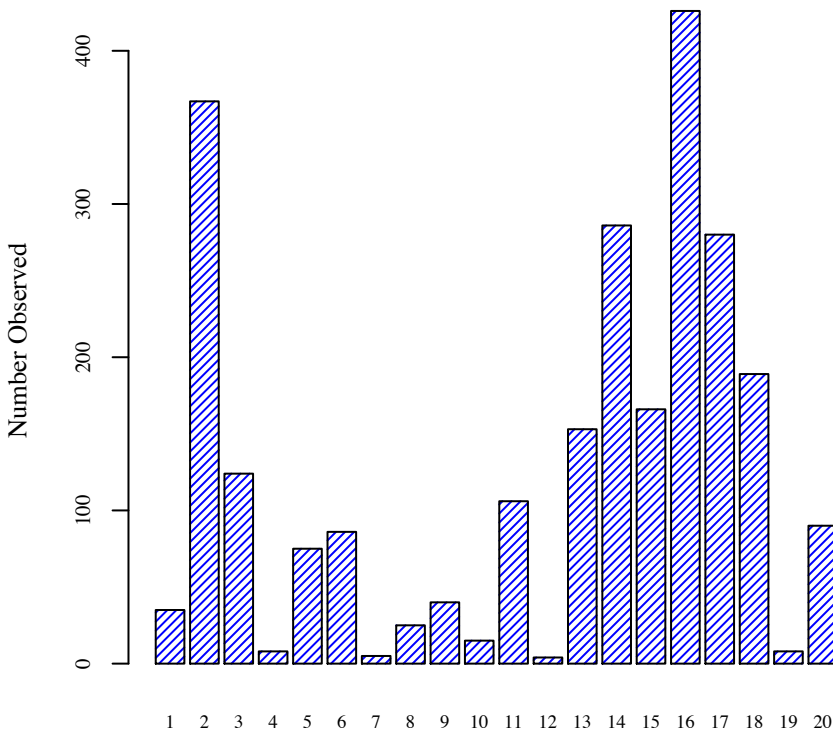
$$W = \exp(-17.3) L^{2.9}$$

Fork Length (mm)

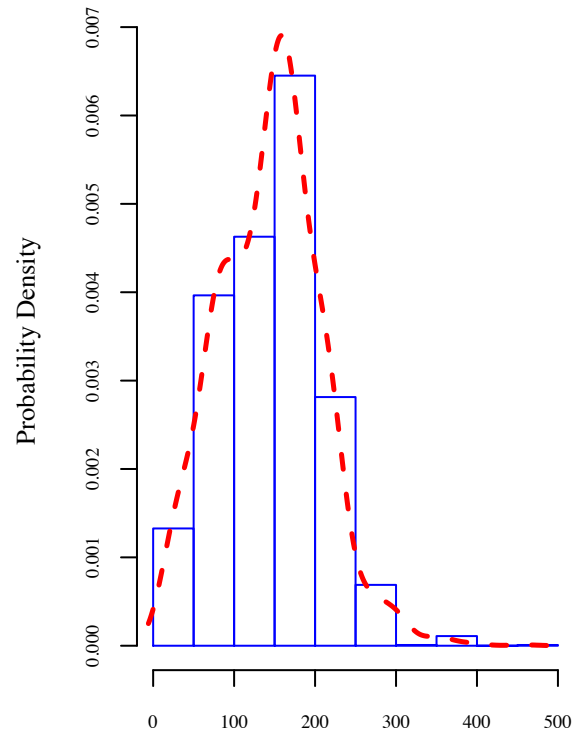
Mean Length = 330 mm

Mean Weight = 0.668 kg

More common in the Western Gulf



Statistical Zones, N = 2,488



Depth (Feet)

Figure 51 . Regression model, location, and depth information for runner, blue (*Caranx crysos*).

Jack, Common Crevalle

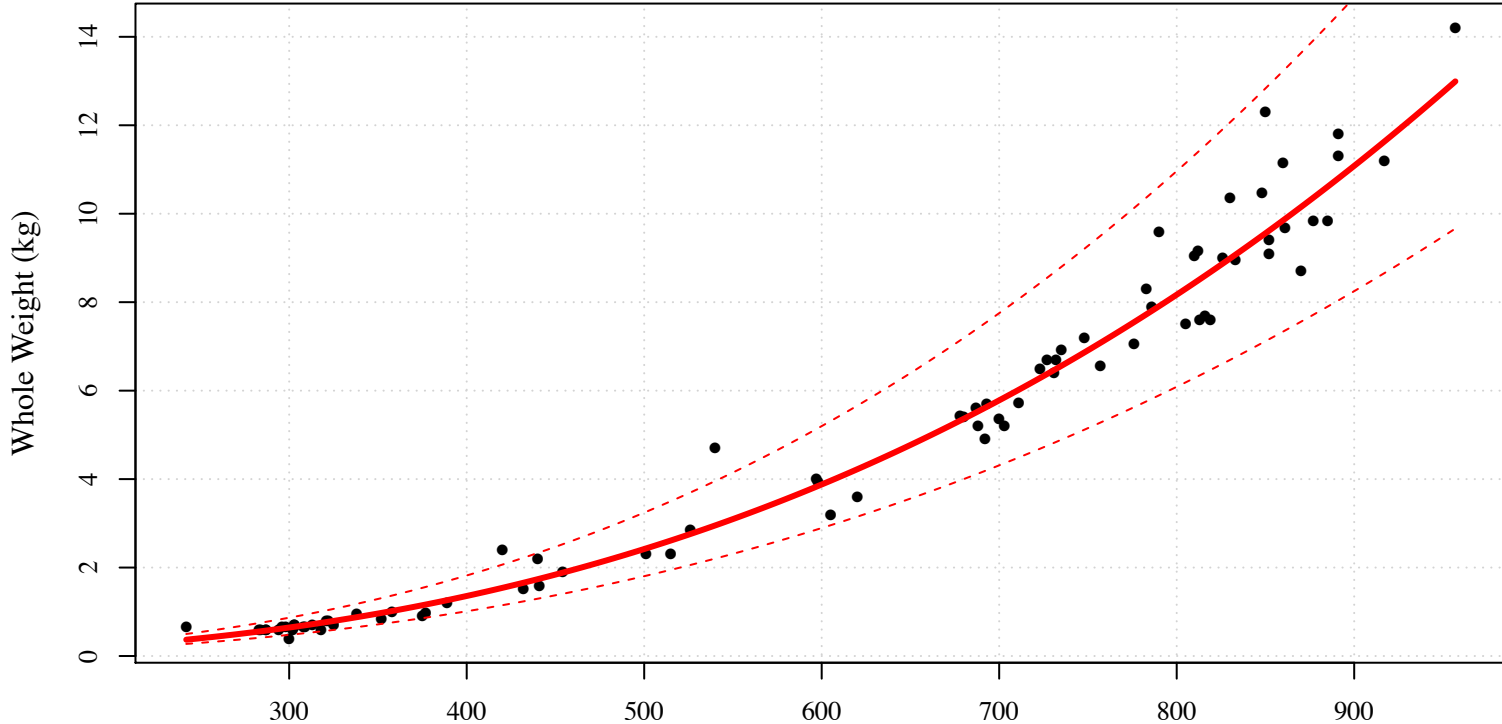
Caranx hippos

$R^2 = 0.983$

N = 81

RSE = 0.146

Most common fate is discarded alive



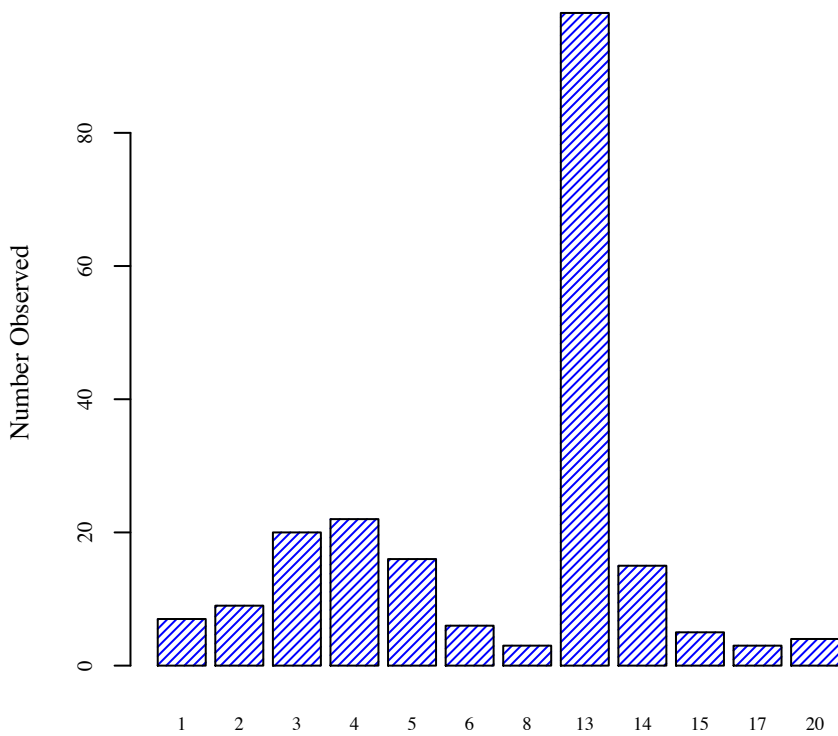
$$W = \exp(-15.2) L^{2.59}$$

Fork Length (mm)

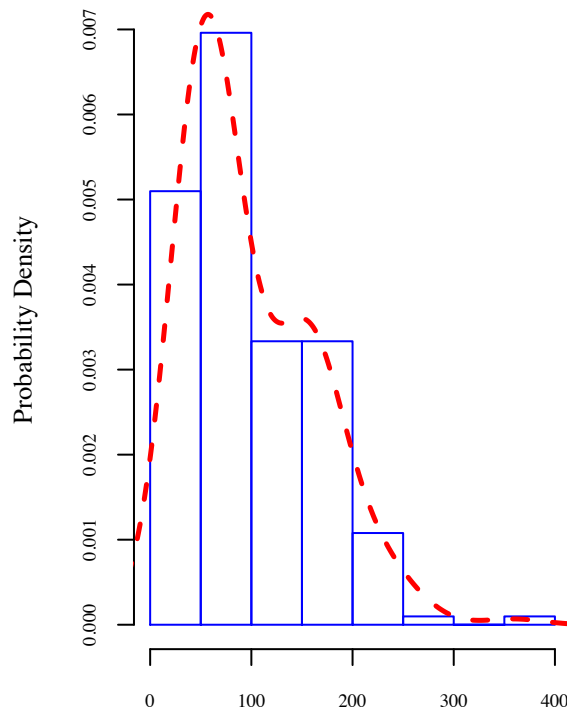
Mean Length = 595 mm

Mean Weight = 4.93 kg

More common in the Western Gulf

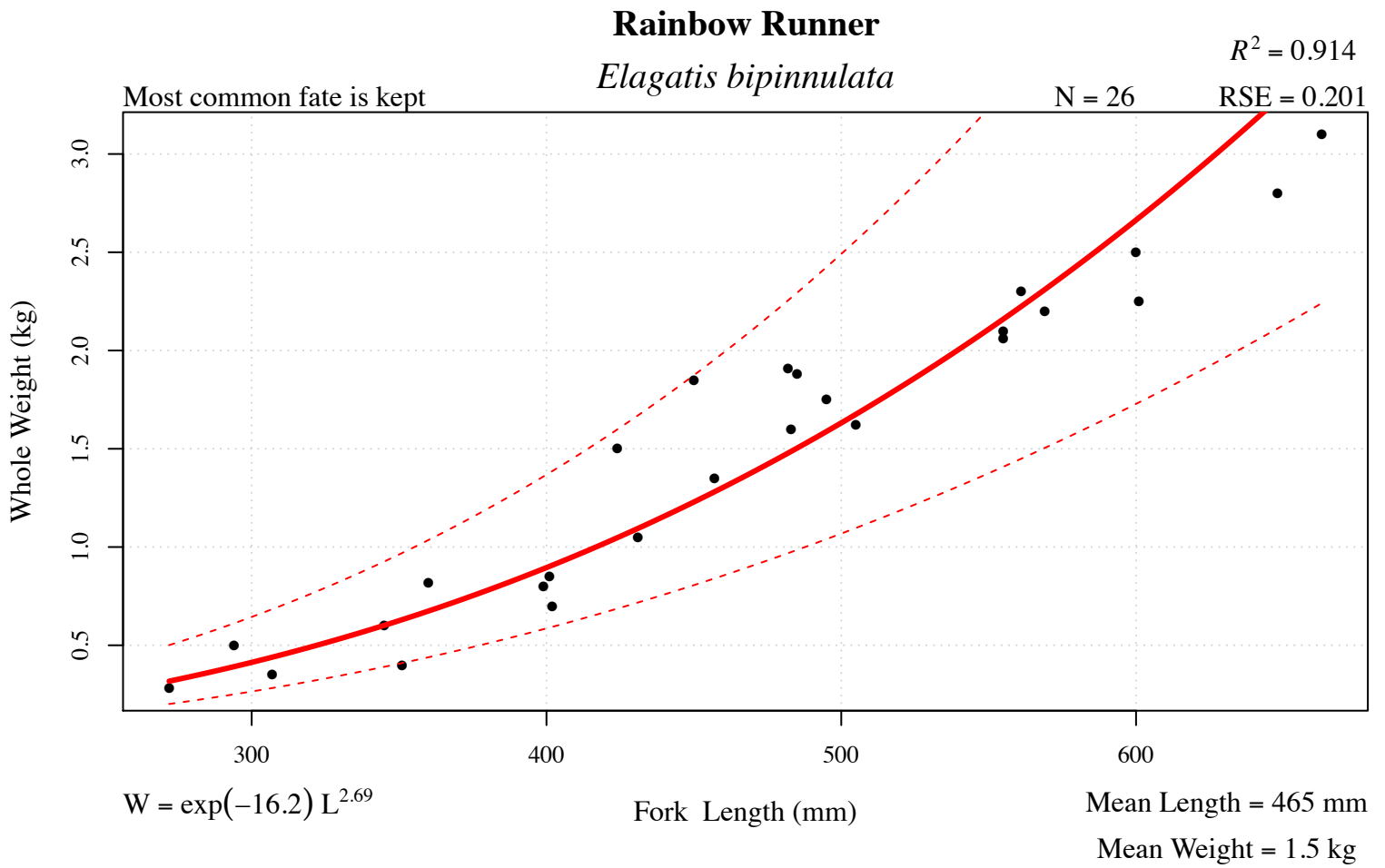


Statistical Zones, N = 208



Depth (Feet)

Figure 52 . Regression model, location, and depth information for jack, common crevalle (*Caranx hippos*).



More common in the Eastern Gulf

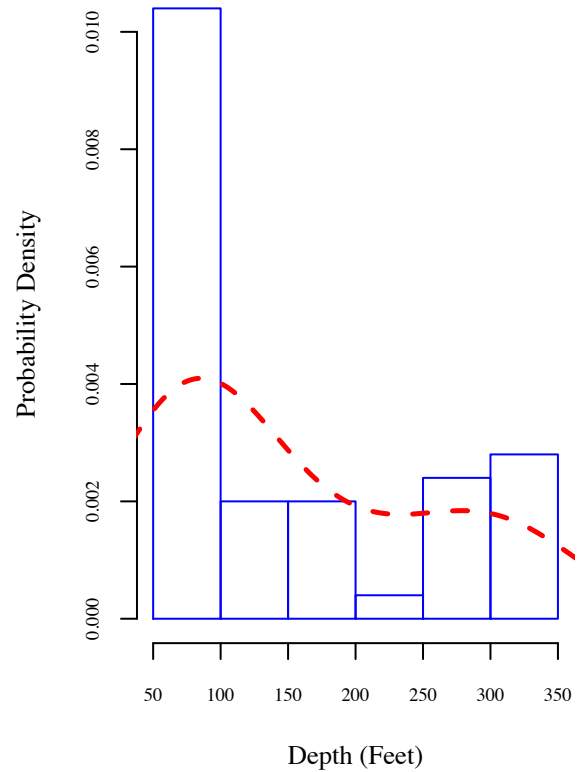
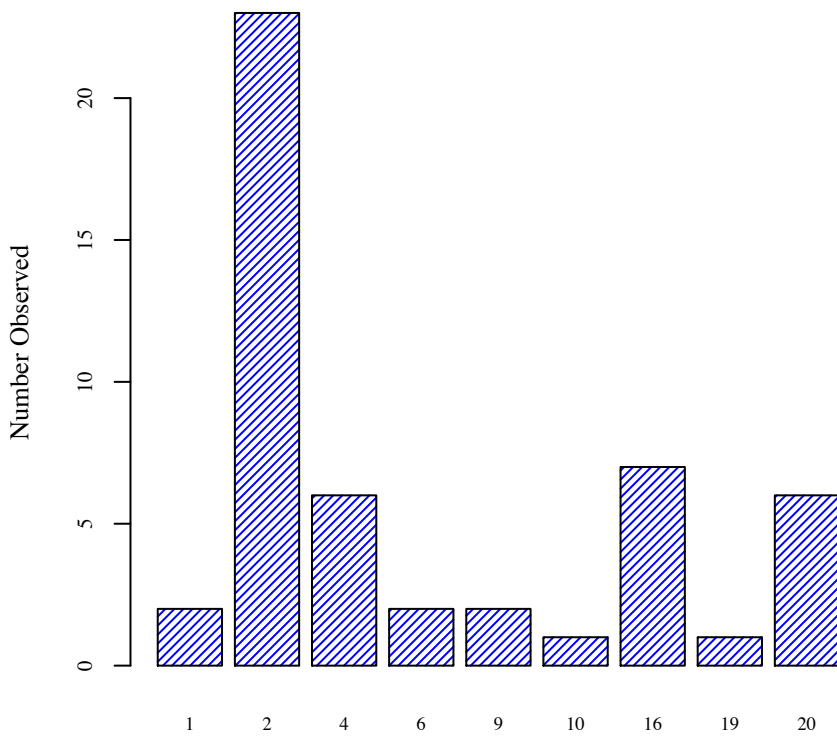


Figure 53 . Regression model, location, and depth information for rainbow runner (*Elagatis bipinnulata*).

Pompano, Florida

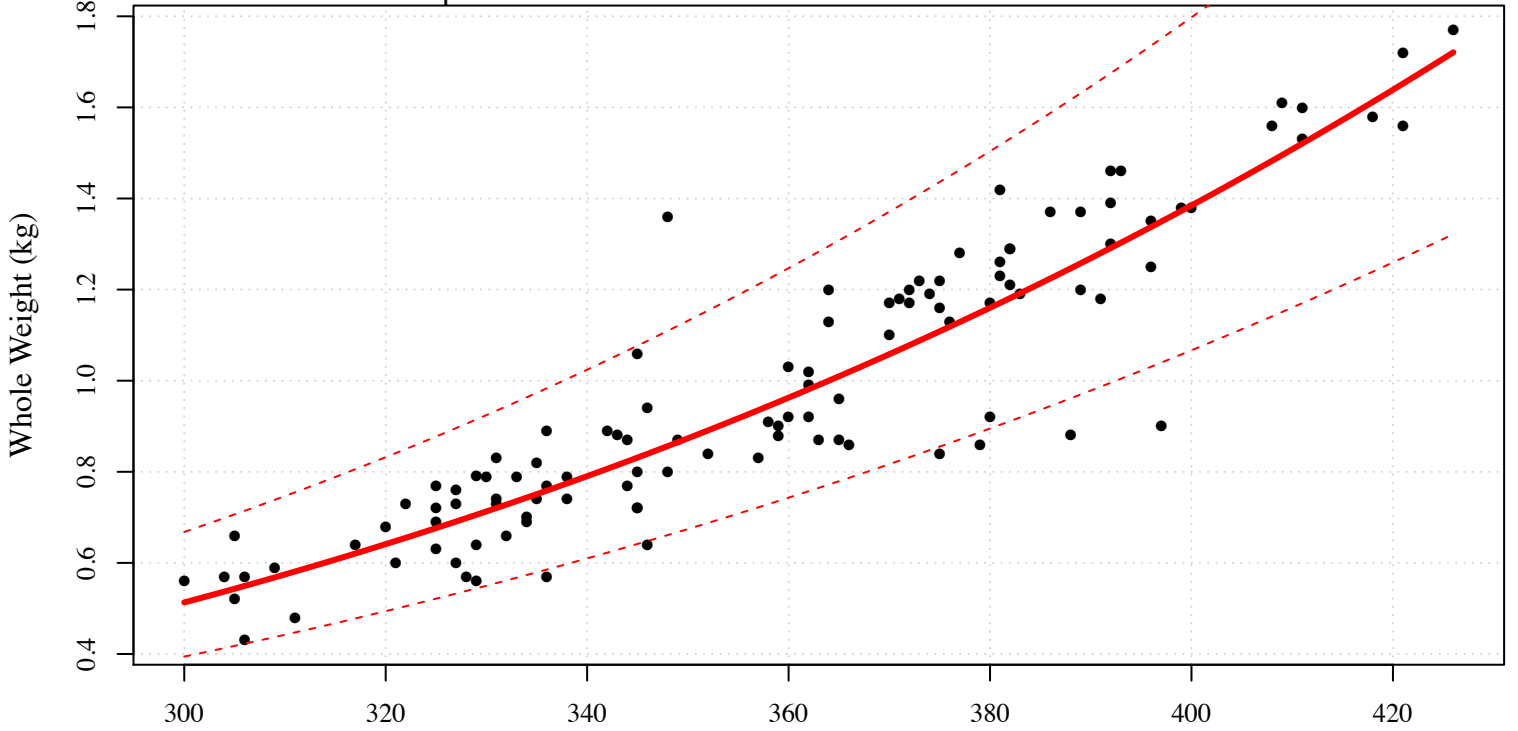
Trachinotus carolinus

$R^2 = 0.836$

N = 111

RSE = 0.13

Most common fate is kept



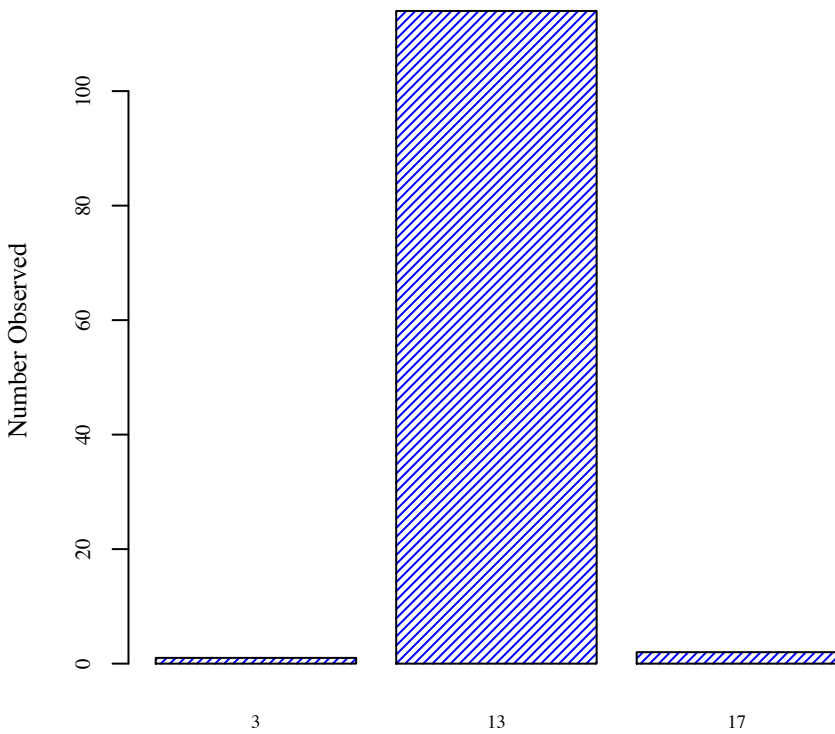
$$W = \exp(-20.3) L^{3.45}$$

Fork Length (mm)

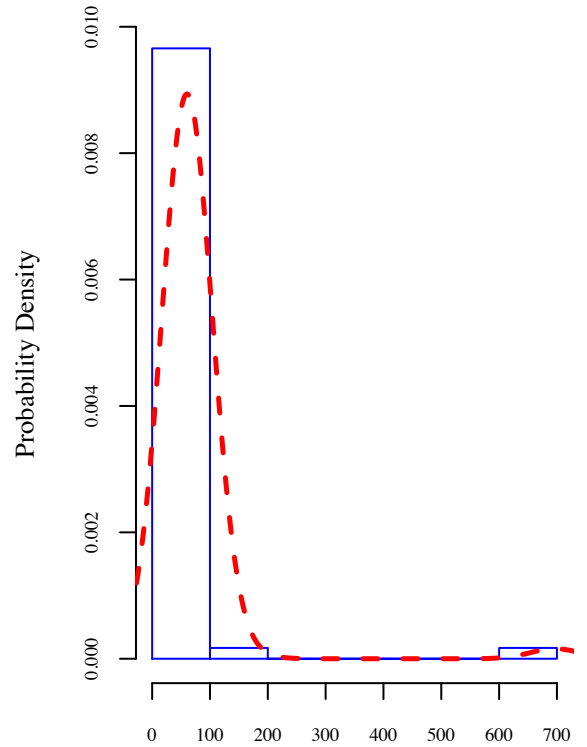
Mean Length = 358 mm

Mean Weight = 0.979 kg

More common in the Western Gulf

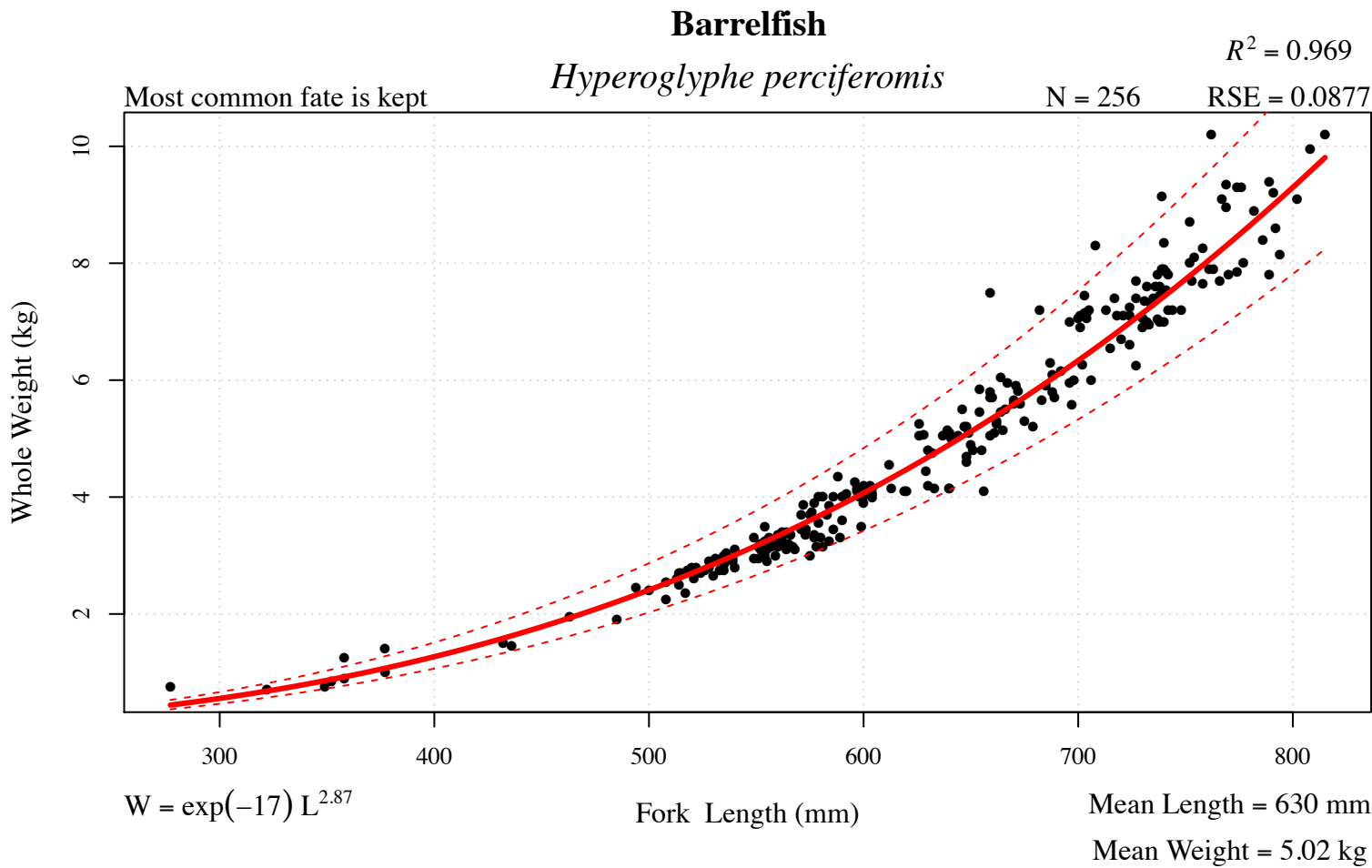


Statistical Zones, N = 117



Depth (Feet)

Figure 54 . Regression model, location, and depth information for pompano, florida (*Trachinotus carolinus*).



More common in the Western Gulf

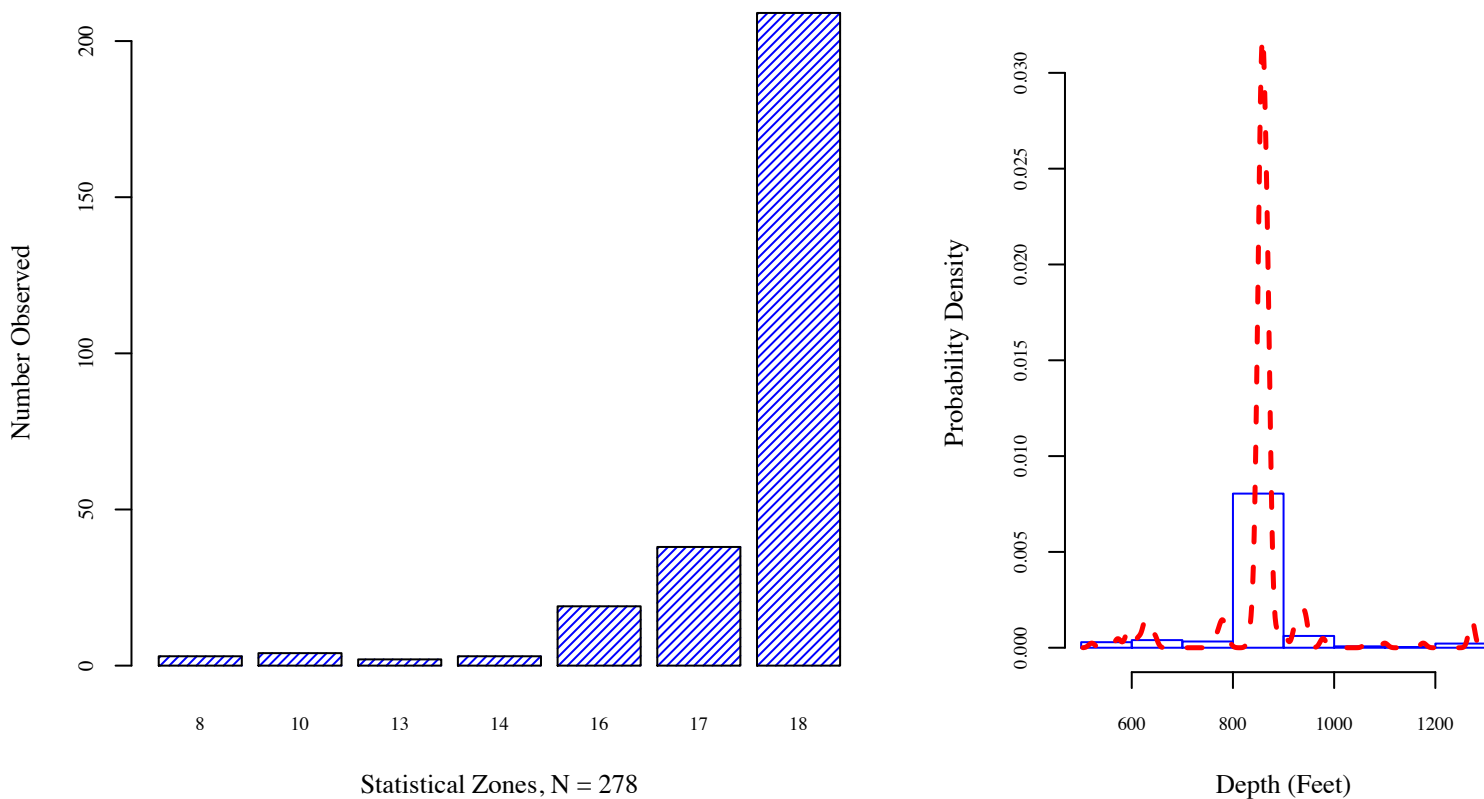
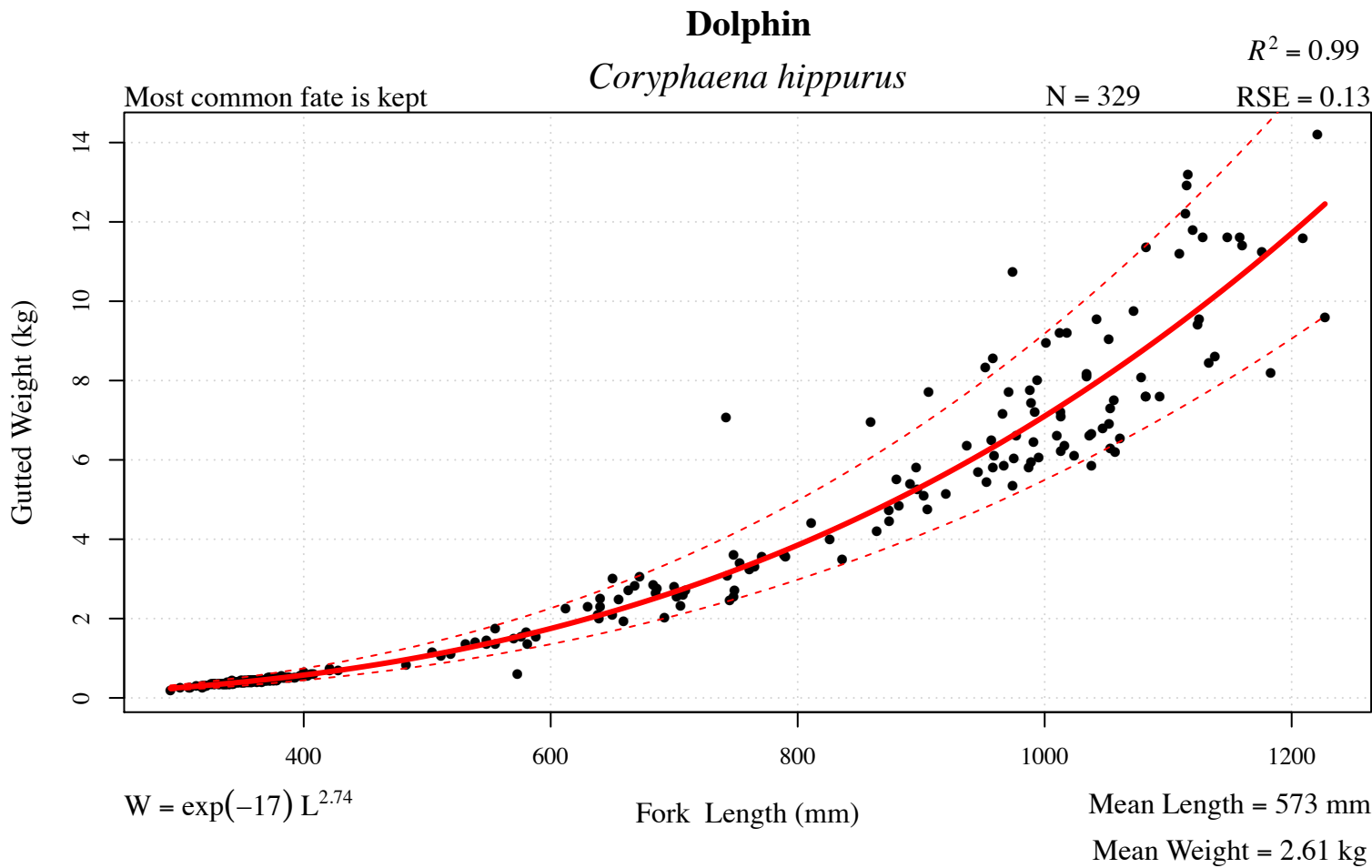


Figure 55 . Regression model, location, and depth information for barrelfish (*Hyperoglyphe perciferomis*).



More common in the Eastern Gulf

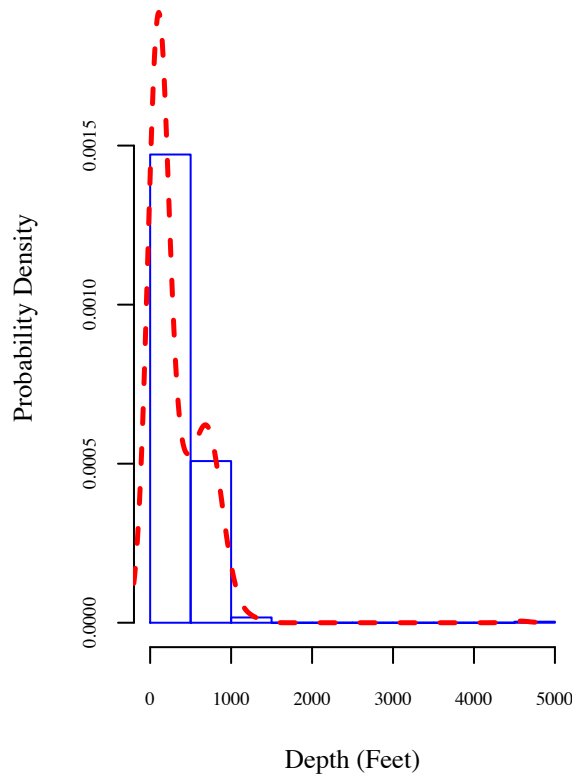
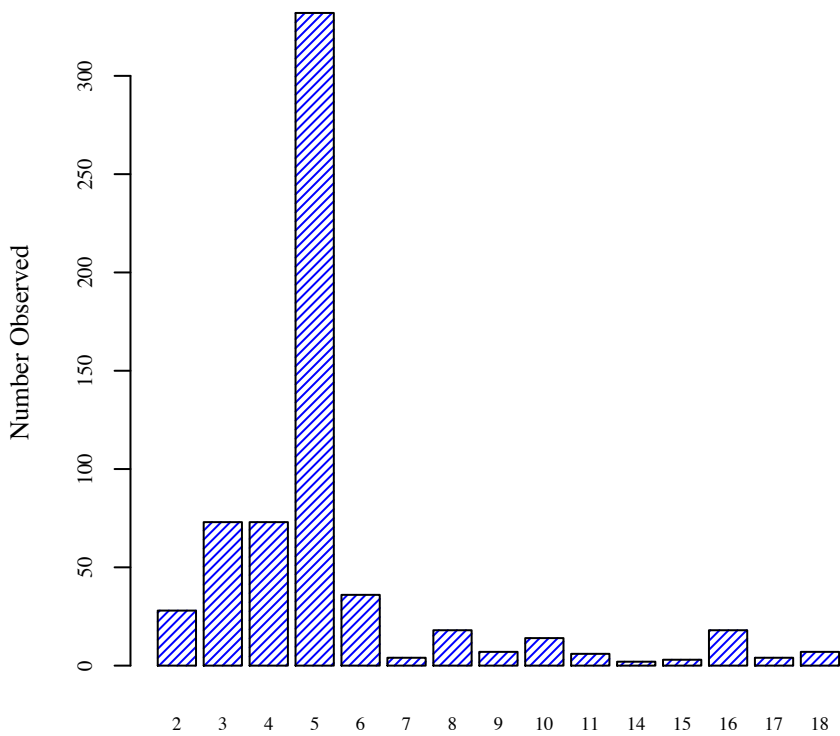
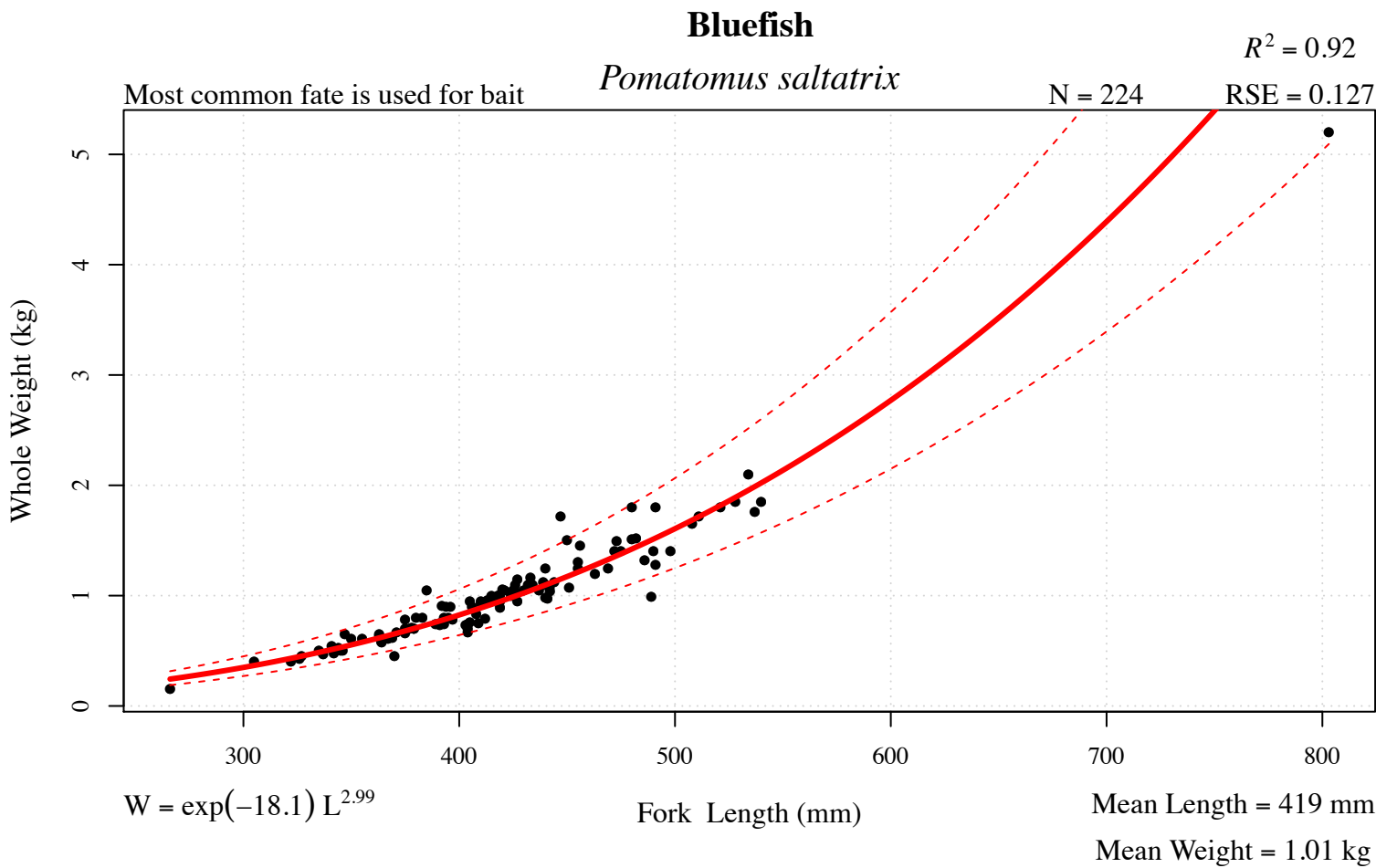


Figure 56 . Regression model, location, and depth information for dolphin (*Coryphaena hippurus*).



More common in the Western Gulf

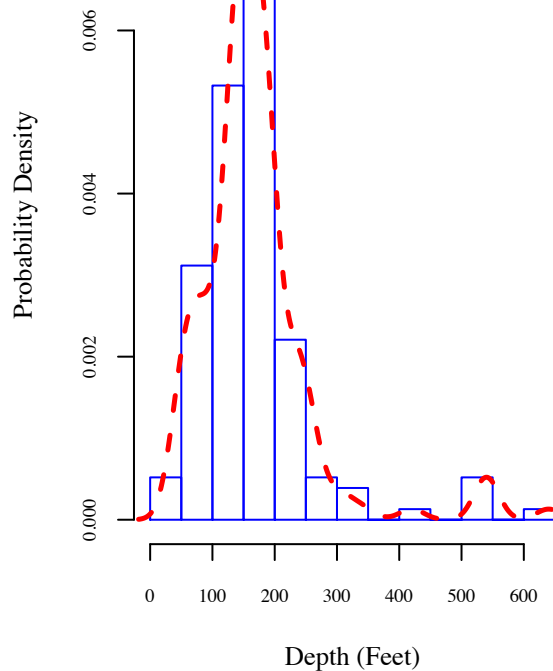
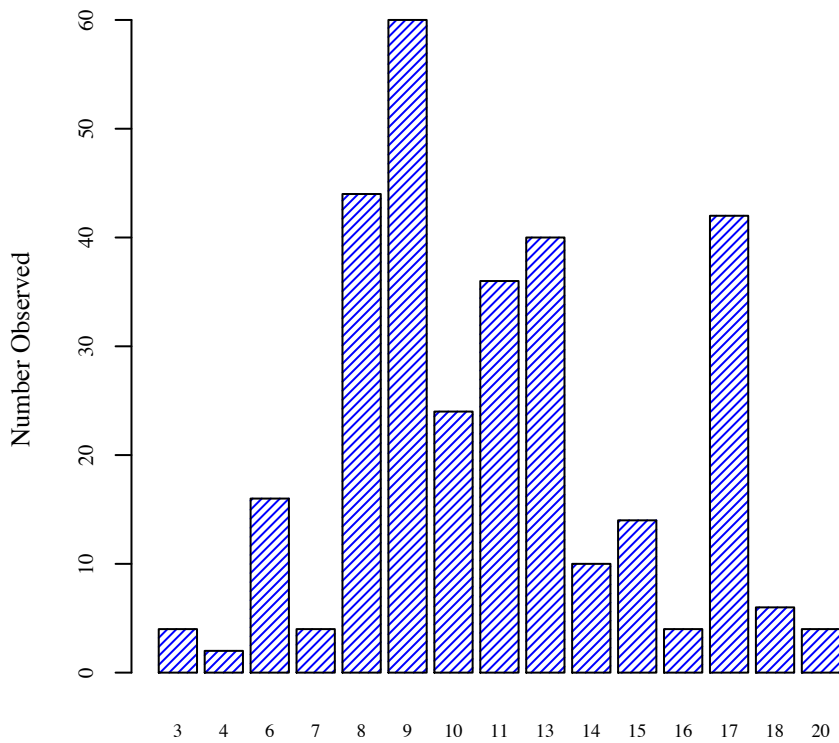
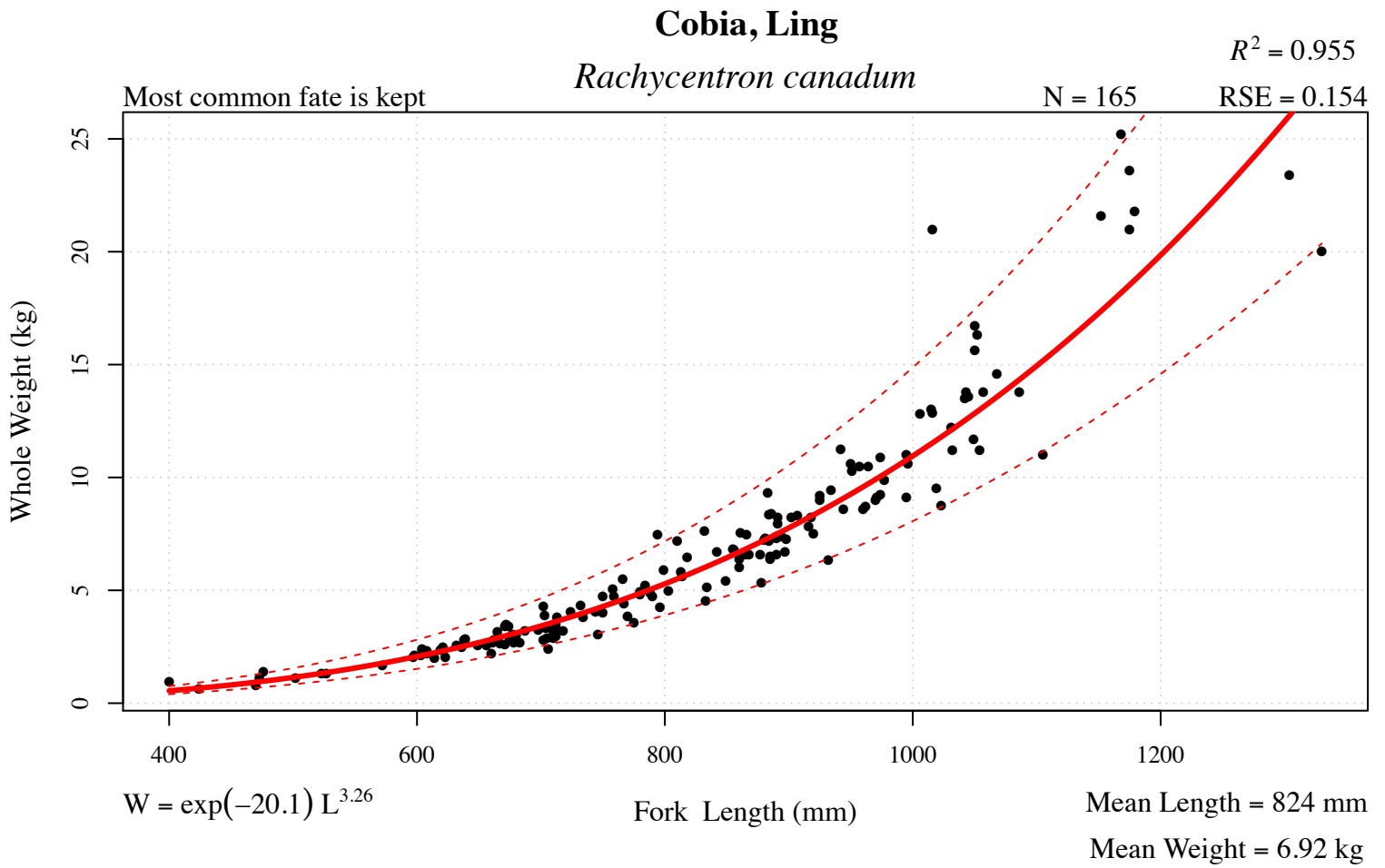


Figure 57 . Regression model, location, and depth information for bluefish (*Pomatomus saltatrix*).



More common in the Eastern Gulf

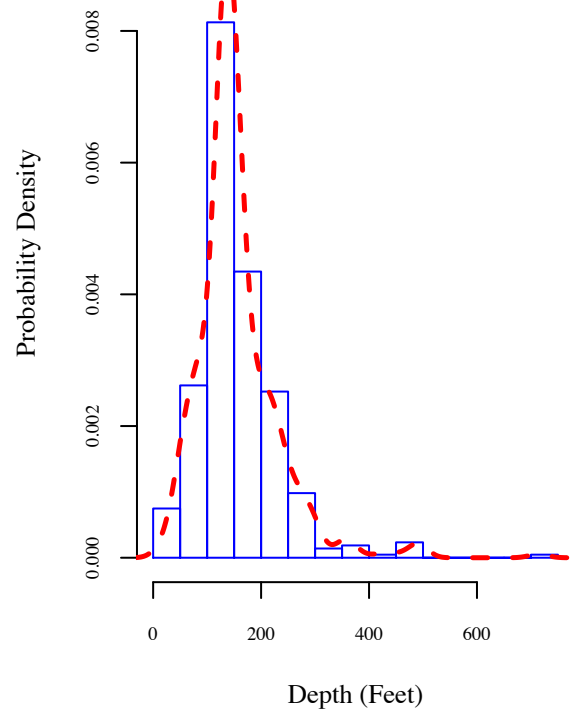
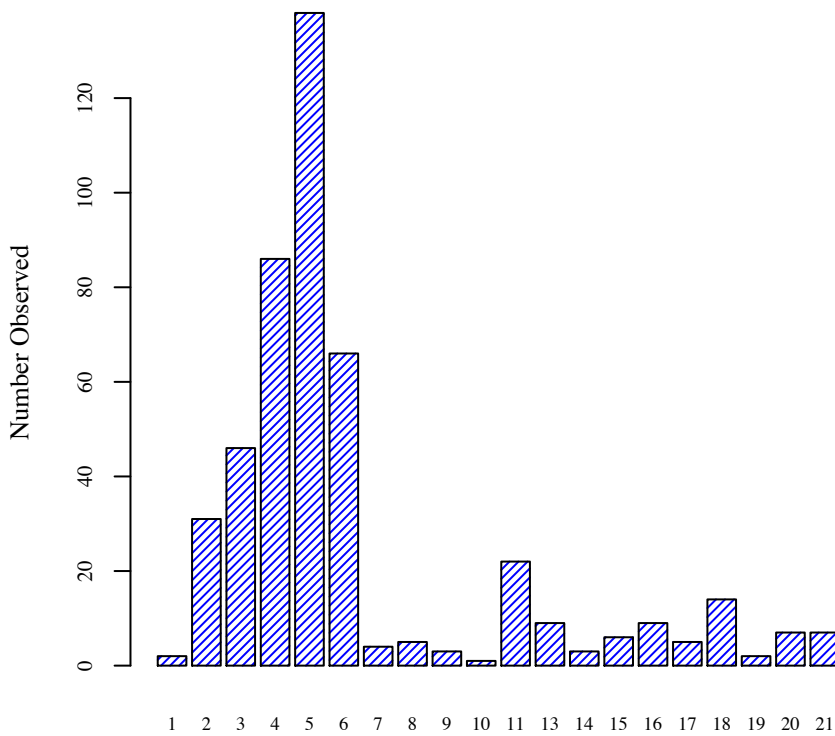
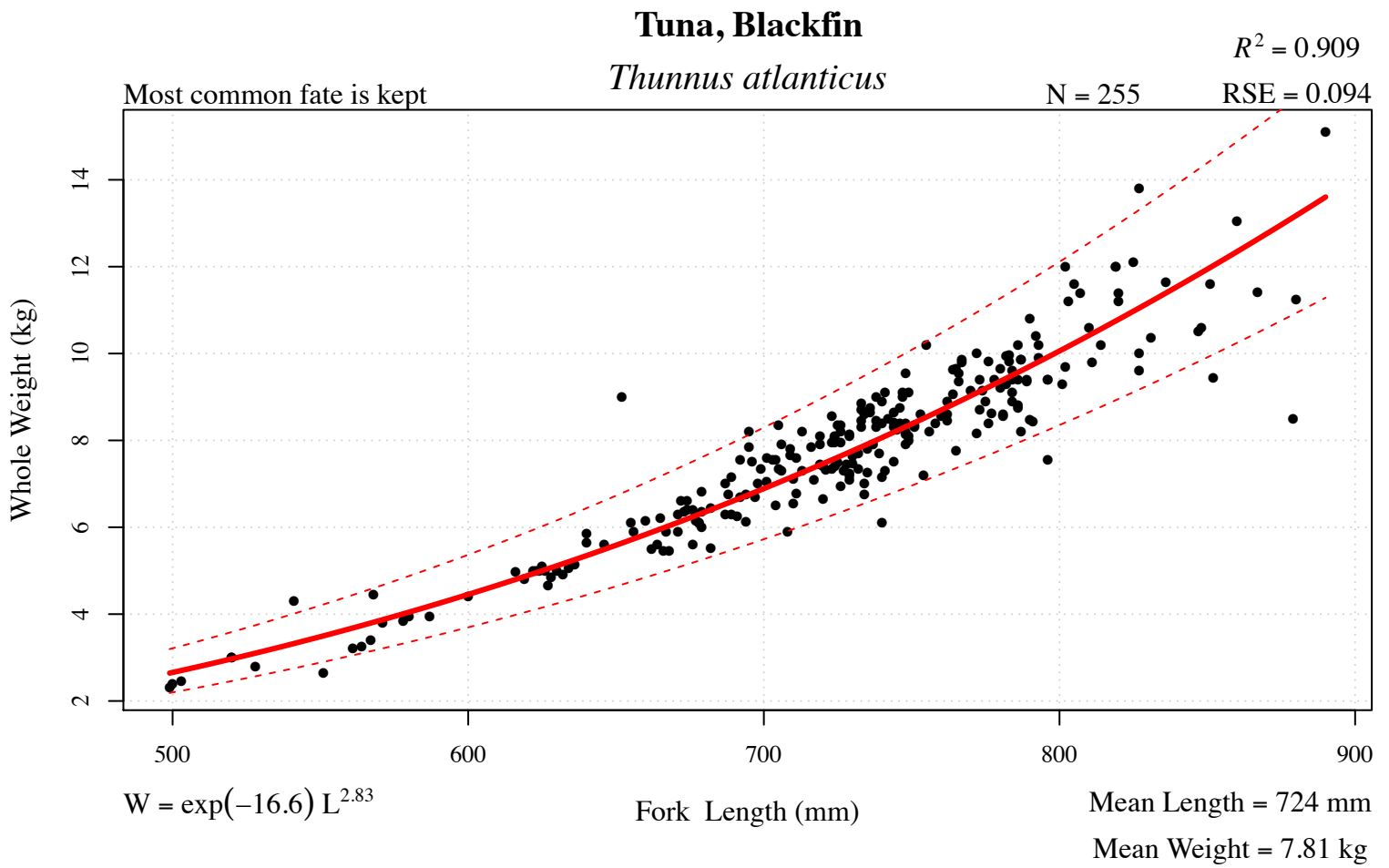


Figure 58 . Regression model, location, and depth information for cobia, ling (*Rachycentron canadum*).



More common in the Eastern Gulf

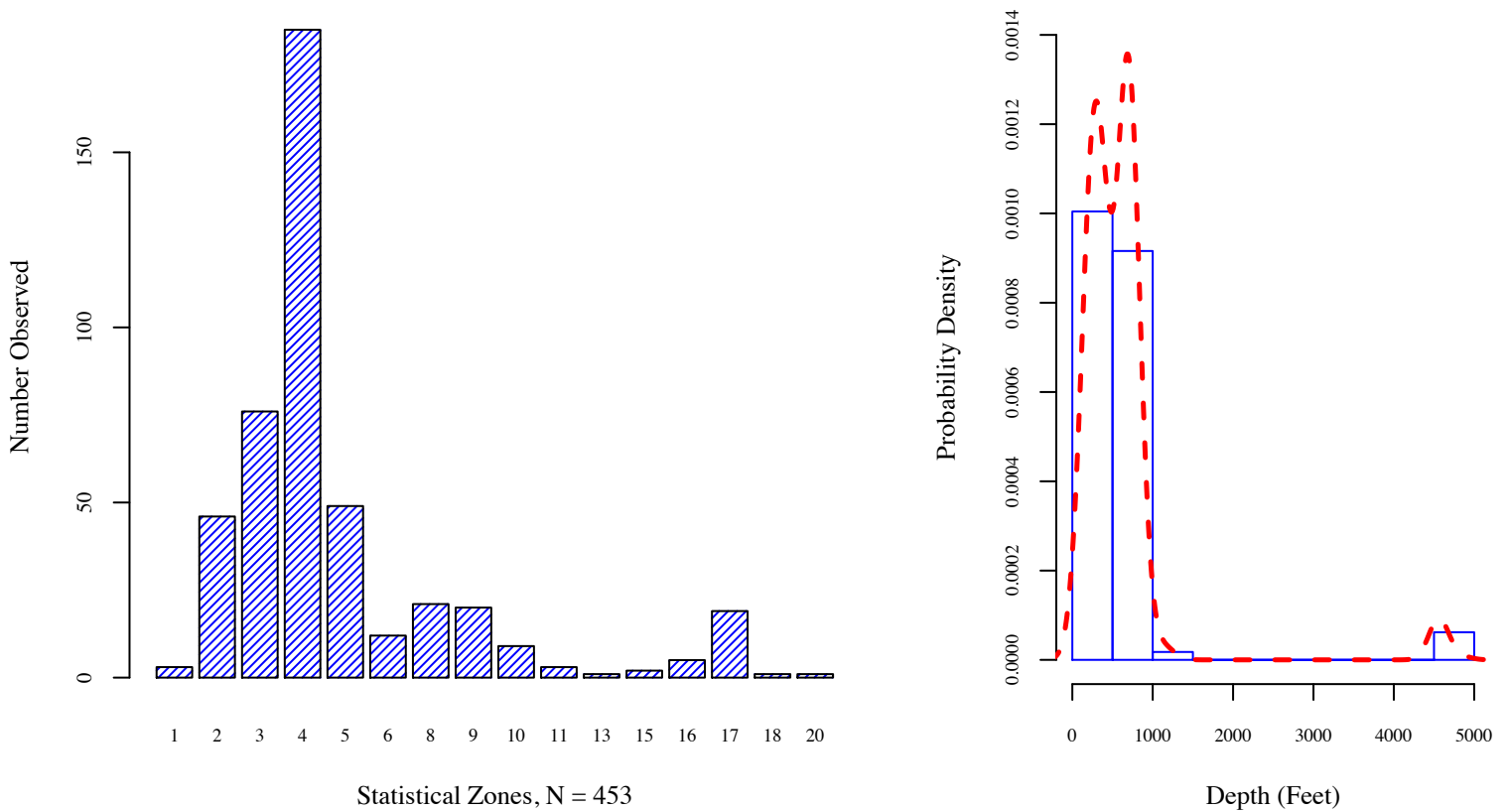
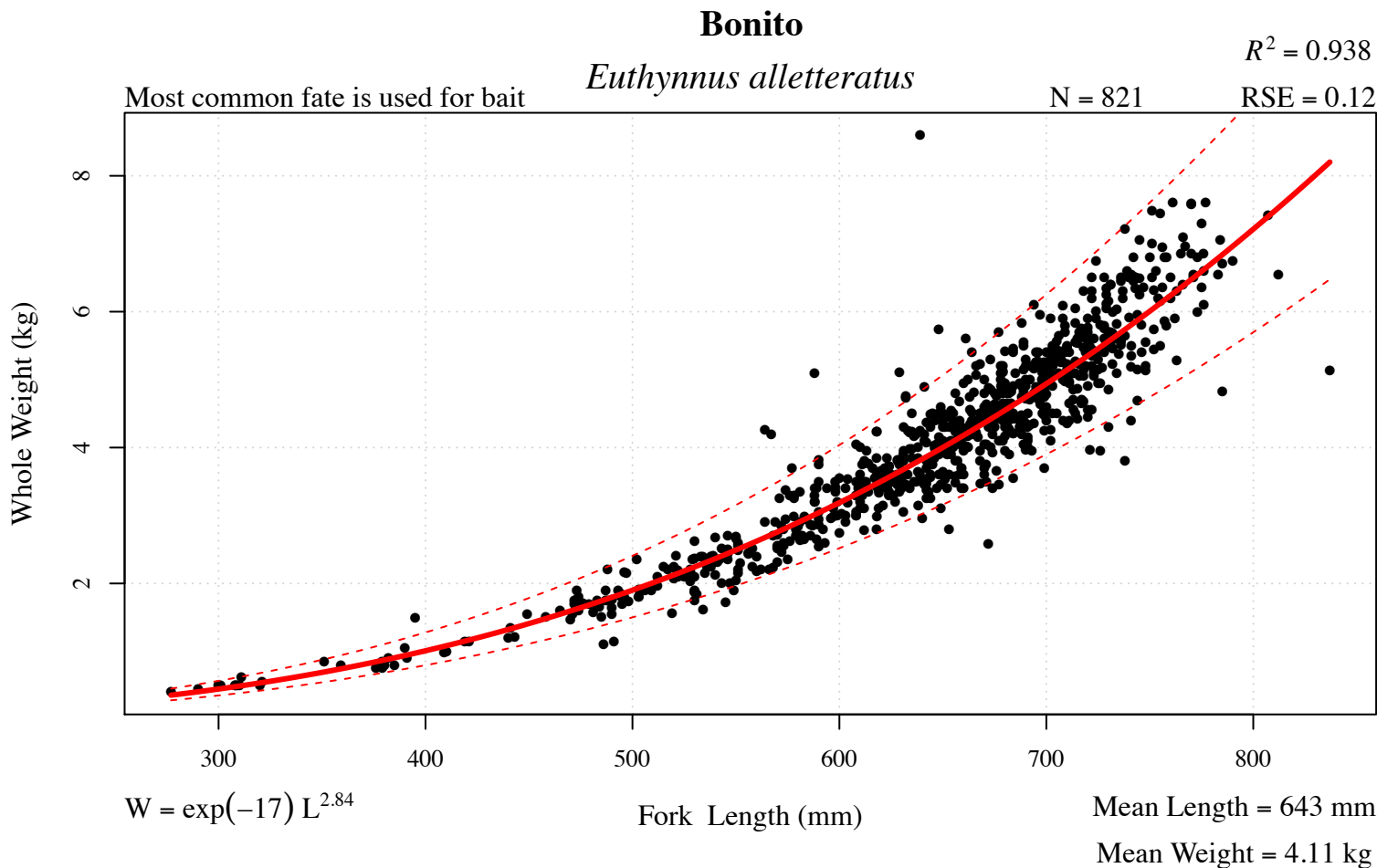


Figure 59 . Regression model, location, and depth information for tuna, blackfin (*Thunnus atlanticus*).



More common in the Eastern Gulf

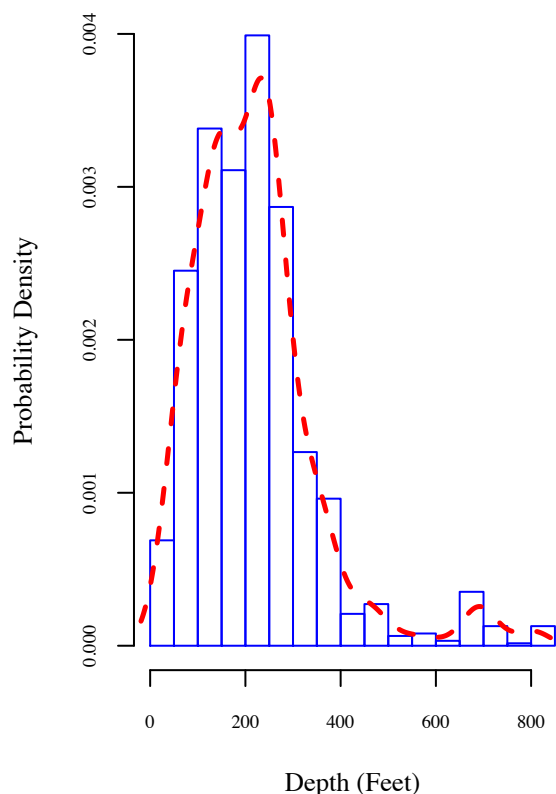
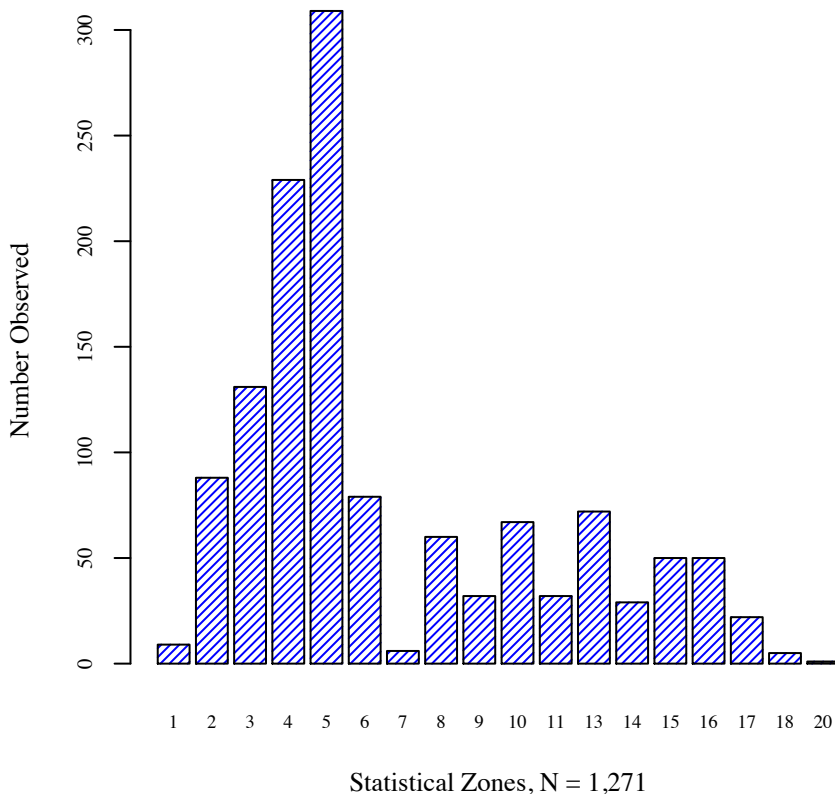


Figure 60 . Regression model, location, and depth information for bonito (*Euthynnus alletteratus*).

Mackerel, Spanish

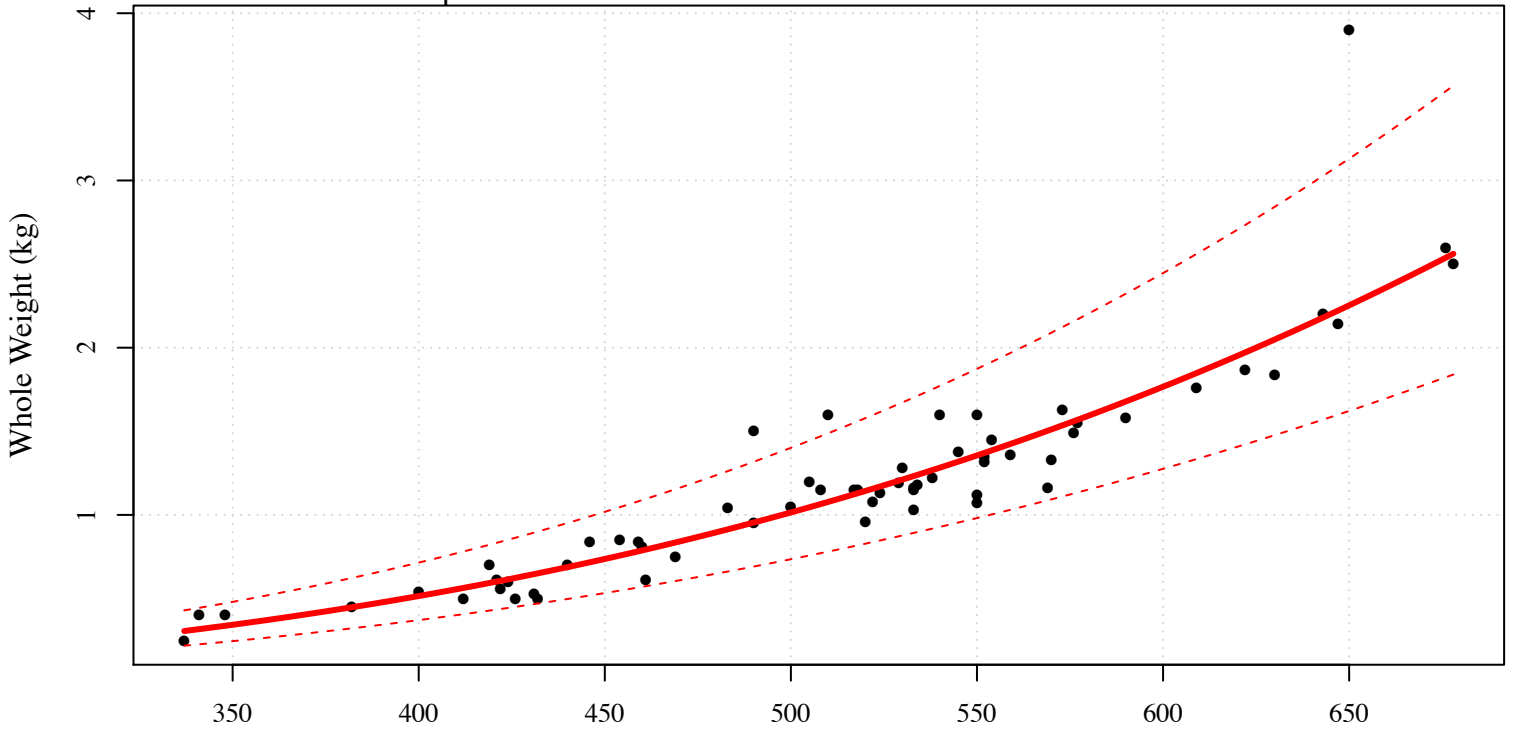
Scomberomorus maculatus

$R^2 = 0.904$

N = 62

RSE = 0.16

Most common fate is kept



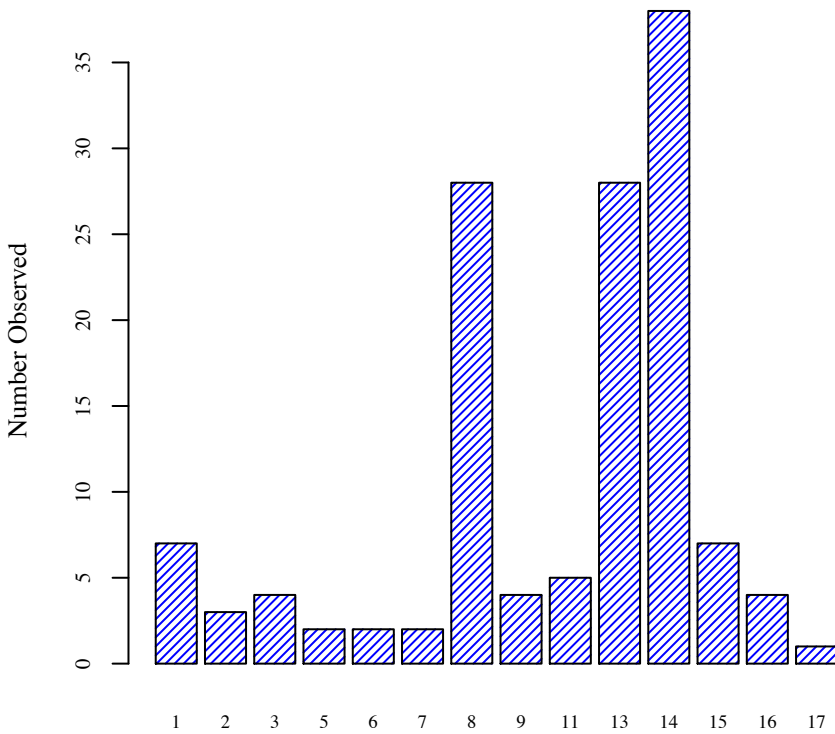
$$W = \exp(-18.9) L^{3.04}$$

Fork Length (mm)

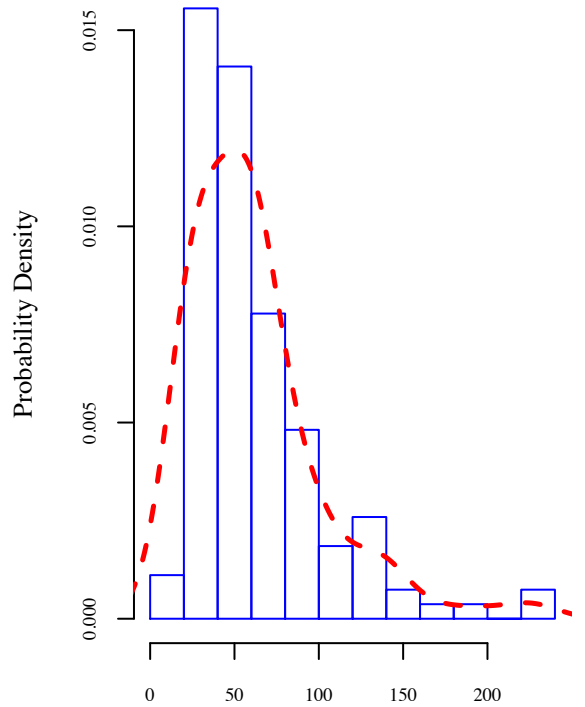
Mean Length = 512 mm

Mean Weight = 1.19 kg

More common in the Western Gulf

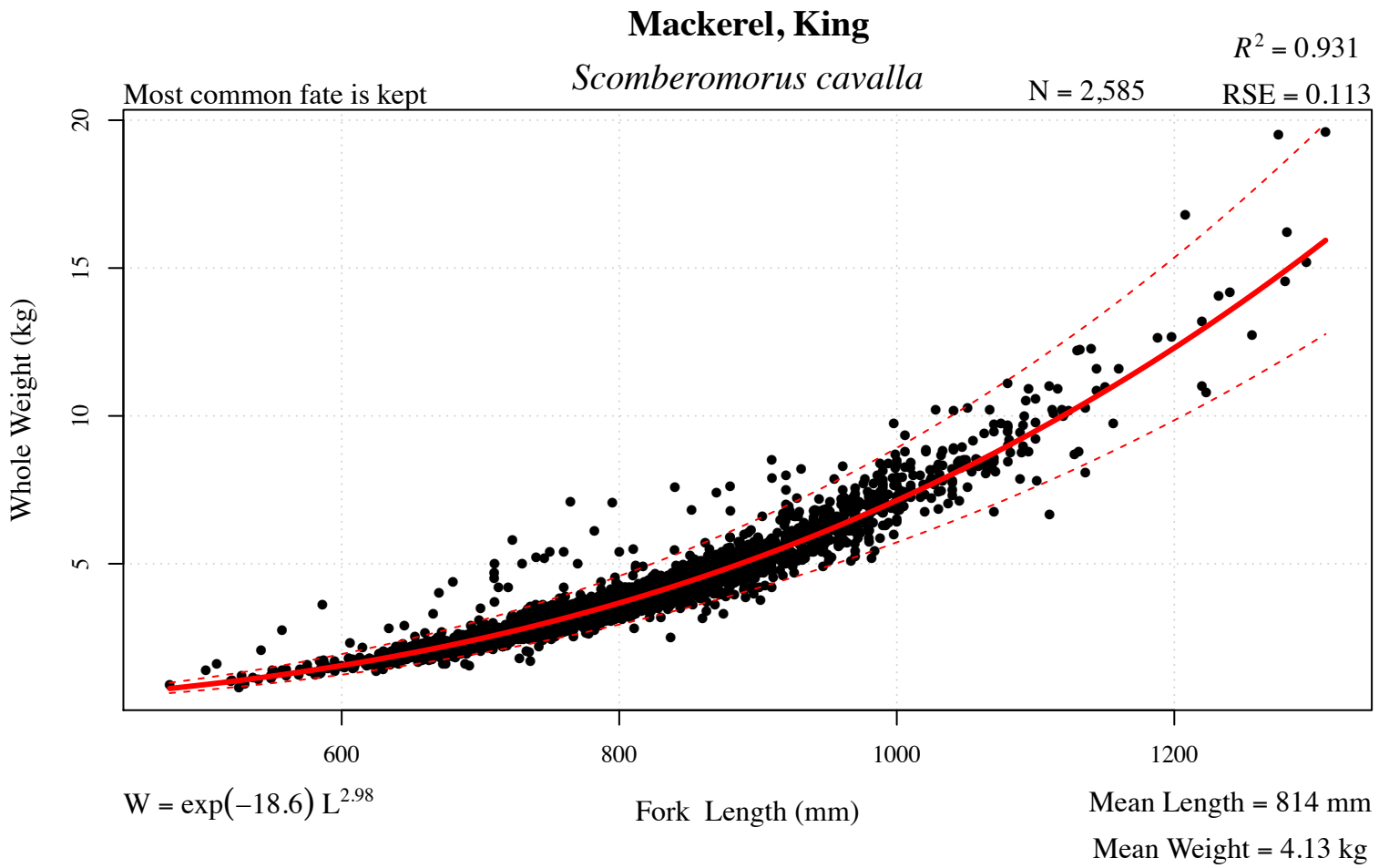


Statistical Zones, N = 135



Depth (Feet)

Figure 61 . Regression model, location, and depth information for mackerel, spanish (*Scomberomorus maculatus*).



More common in the Eastern Gulf

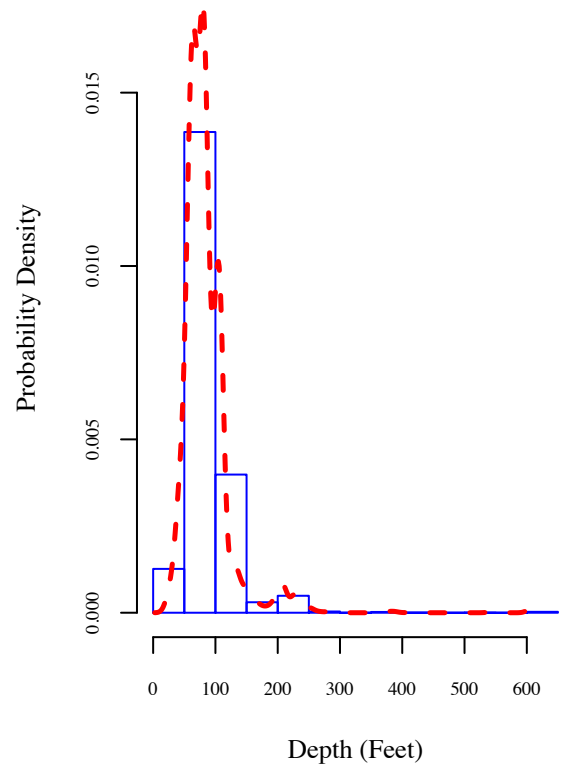
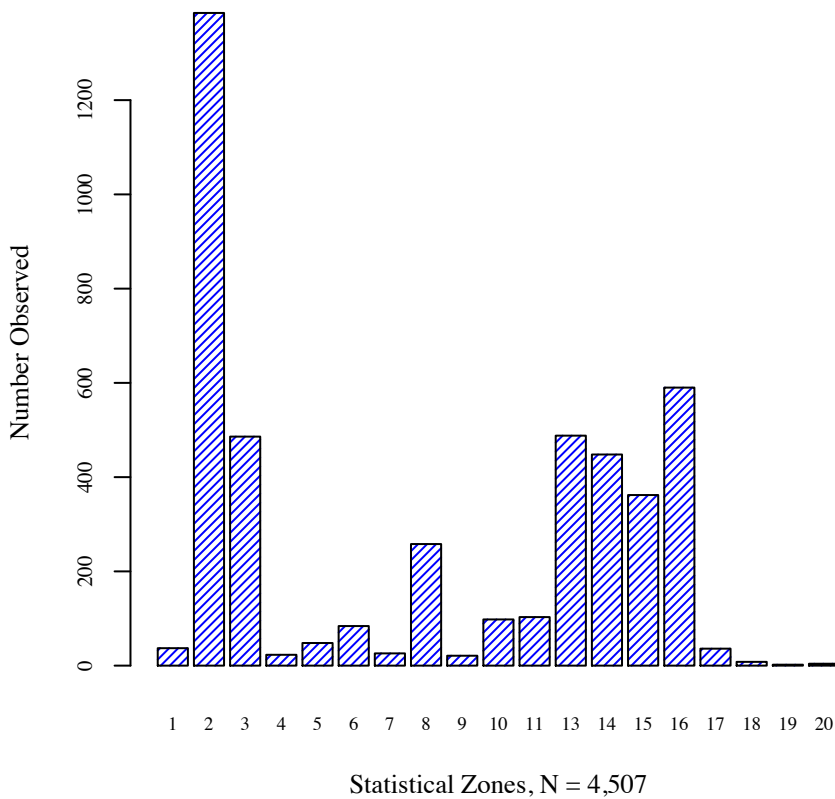
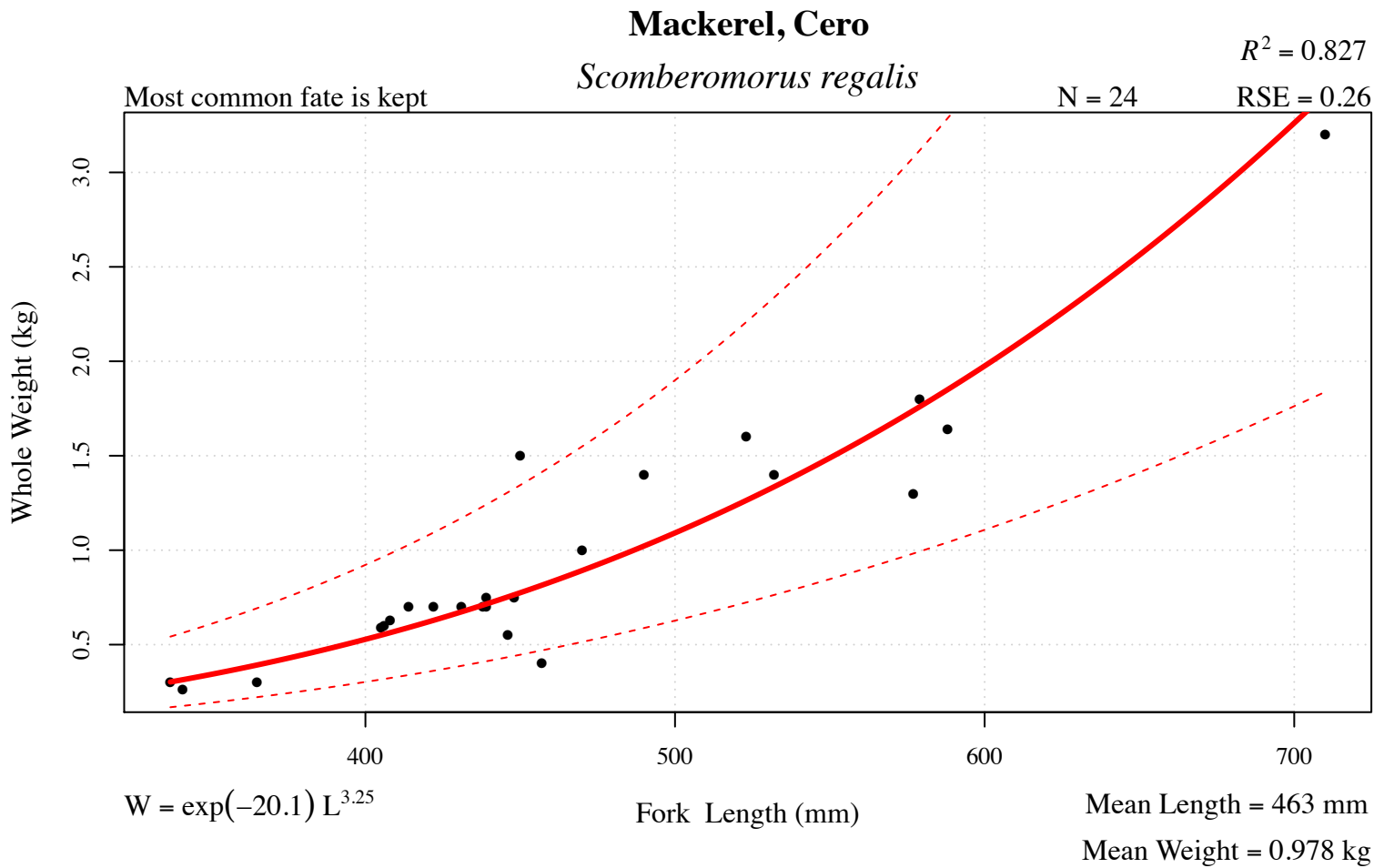


Figure 62 . Regression model, location, and depth information for mackerel, king (*Scomberomorus cavalla*).



More common in the Eastern Gulf

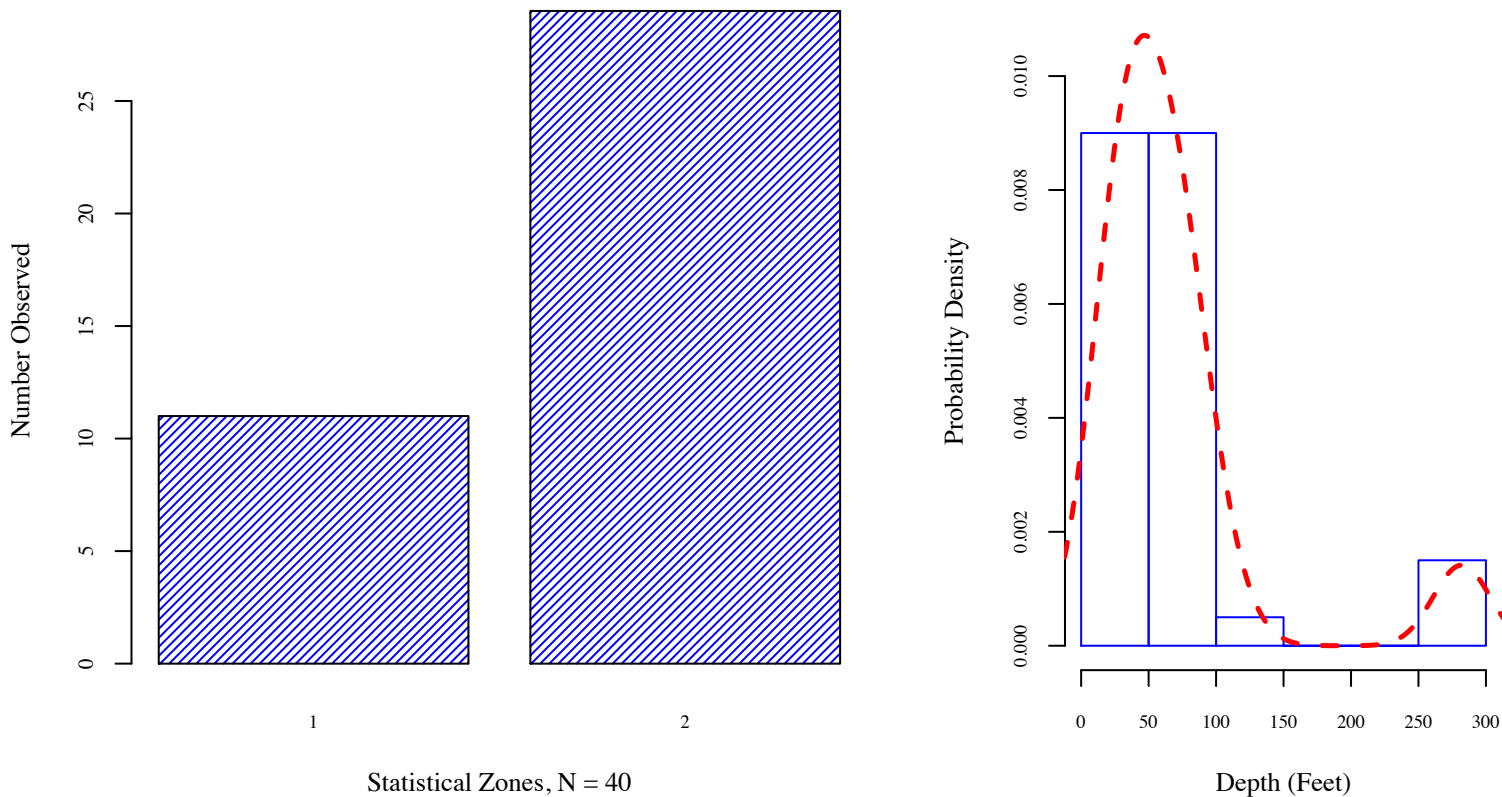
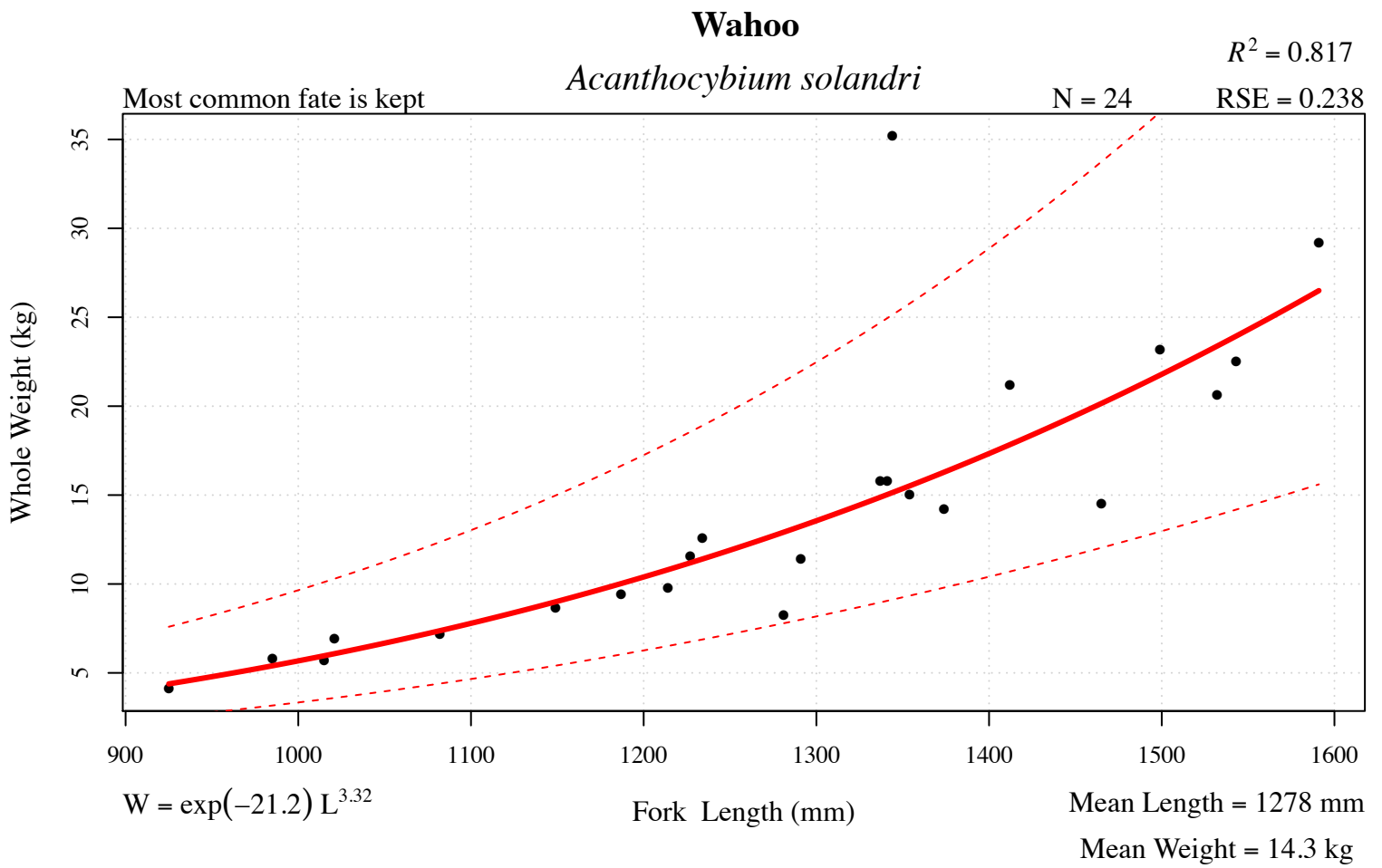


Figure 63 . Regression model, location, and depth information for mackerel, cero (*Scomberomorus regalis*).



More common in the Eastern Gulf

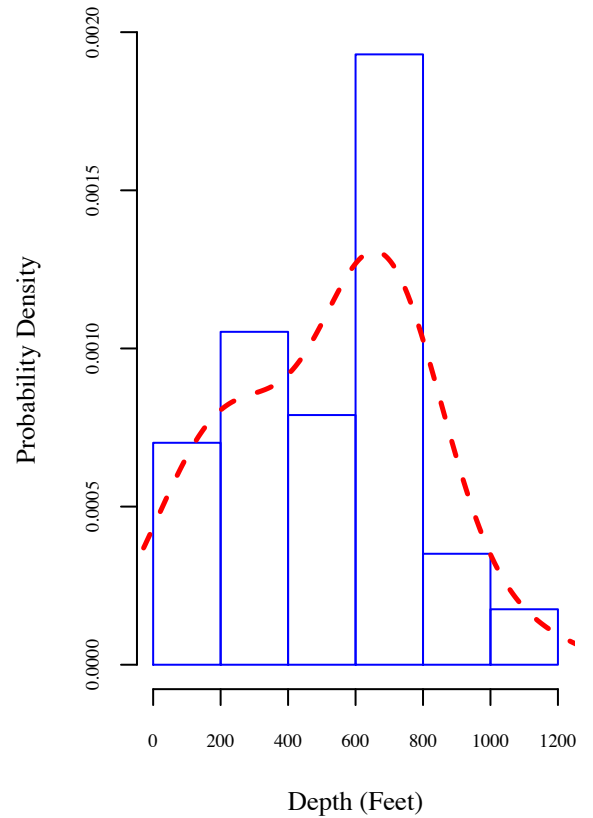
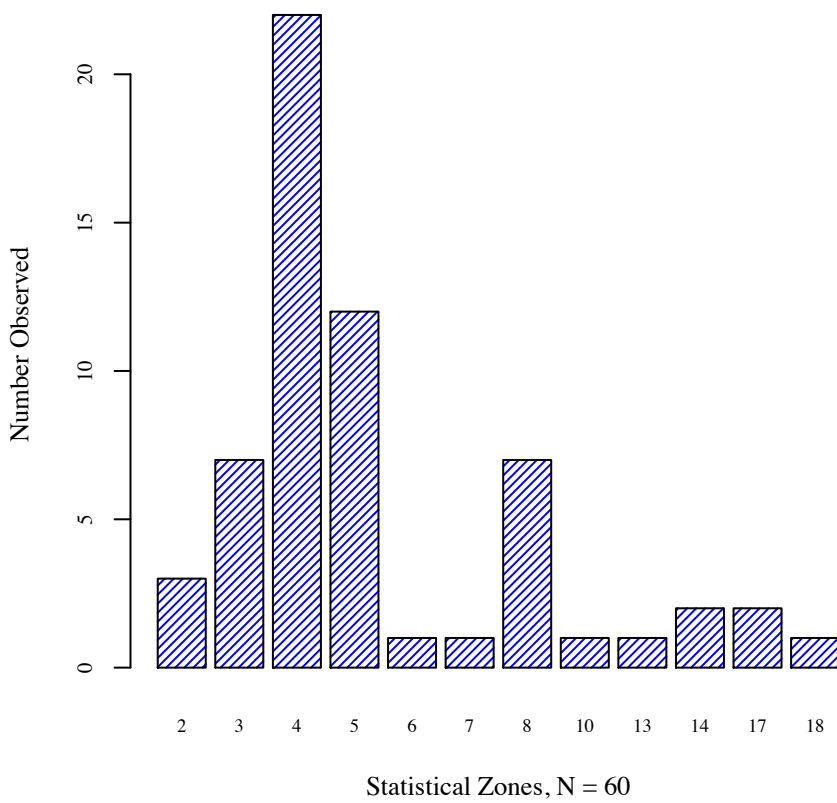


Figure 64 . Regression model, location, and depth information for wahoo (*Acanthocybium solandri*).

Barracuda, Great

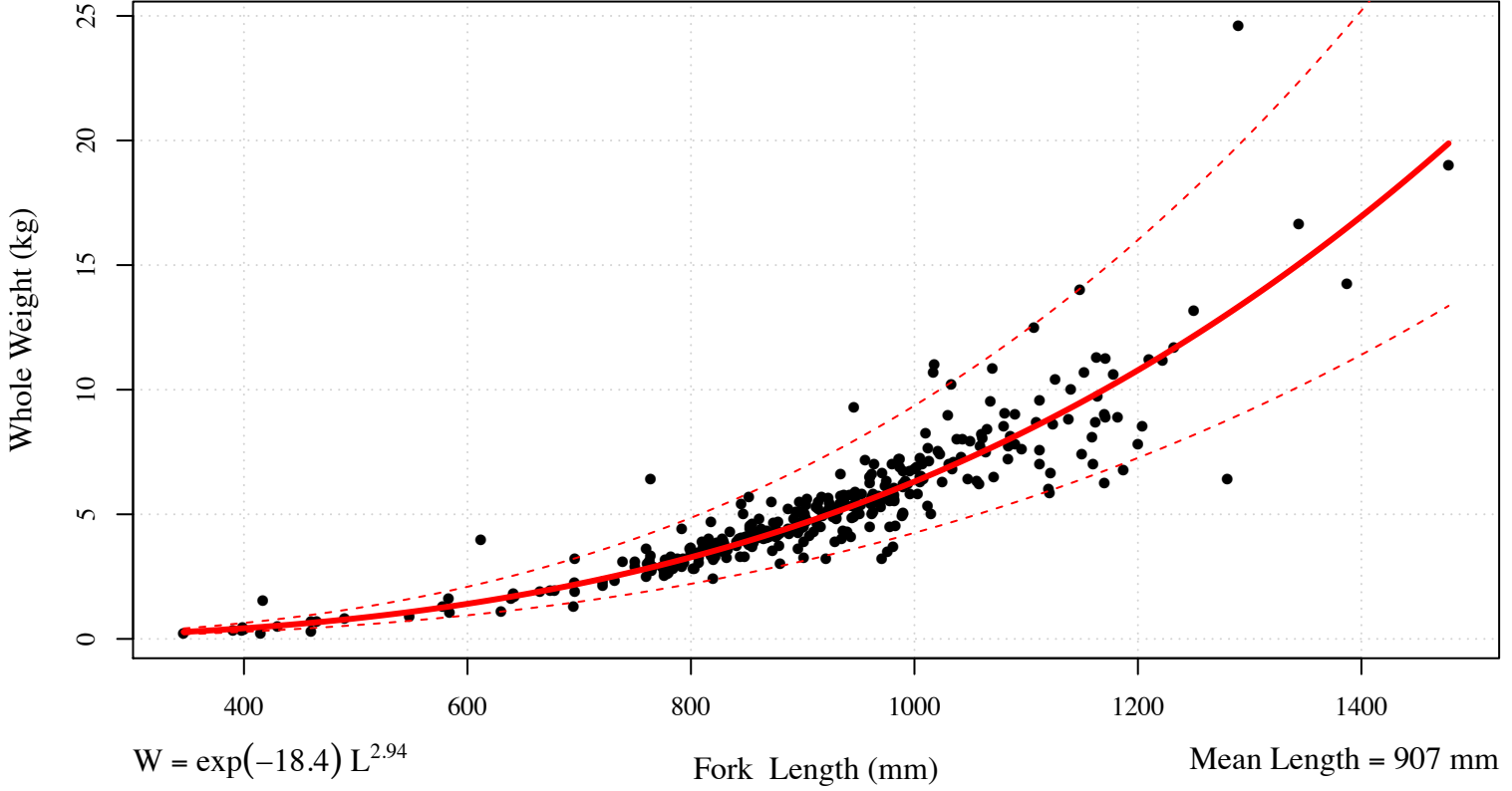
Sphyraena barracuda

$R^2 = 0.902$

N = 350

RSE = 0.2

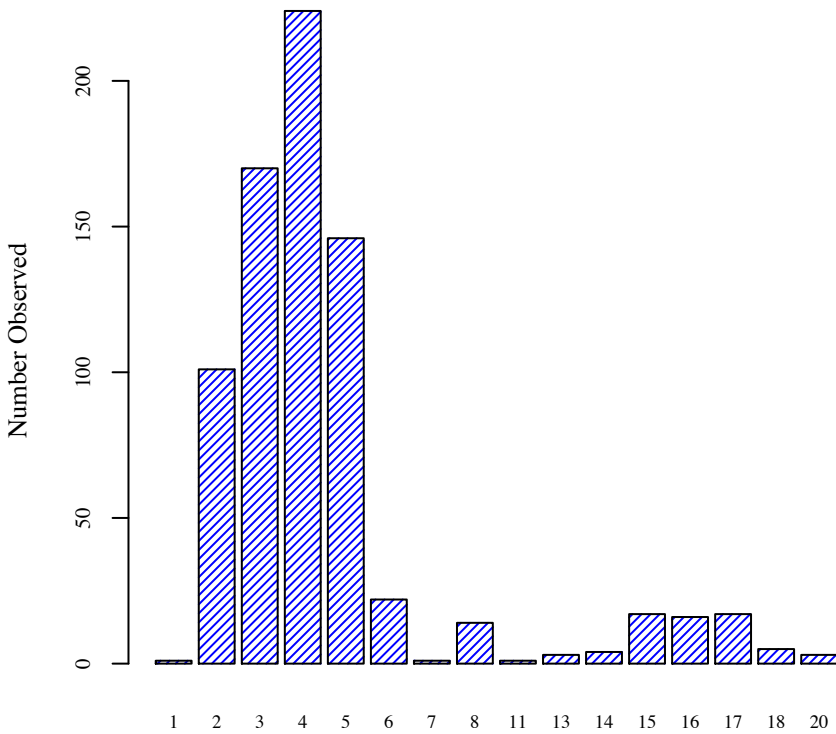
Most common fate is used for bait



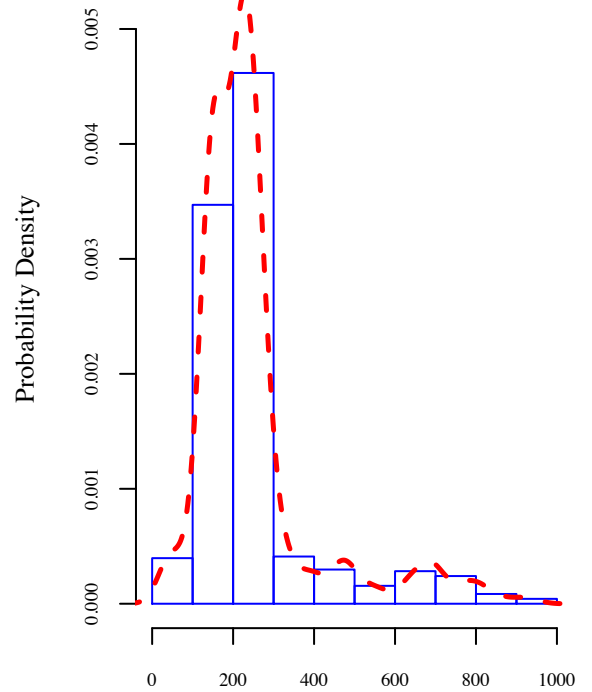
Mean Length = 907 mm

Mean Weight = 5.25 kg

More common in the Eastern Gulf



Statistical Zones, N = 745



Depth (Feet)

Figure 65 . Regression model, location, and depth information for barracuda, great (*Sphyraena barracuda*).

Triggerfish, Gray

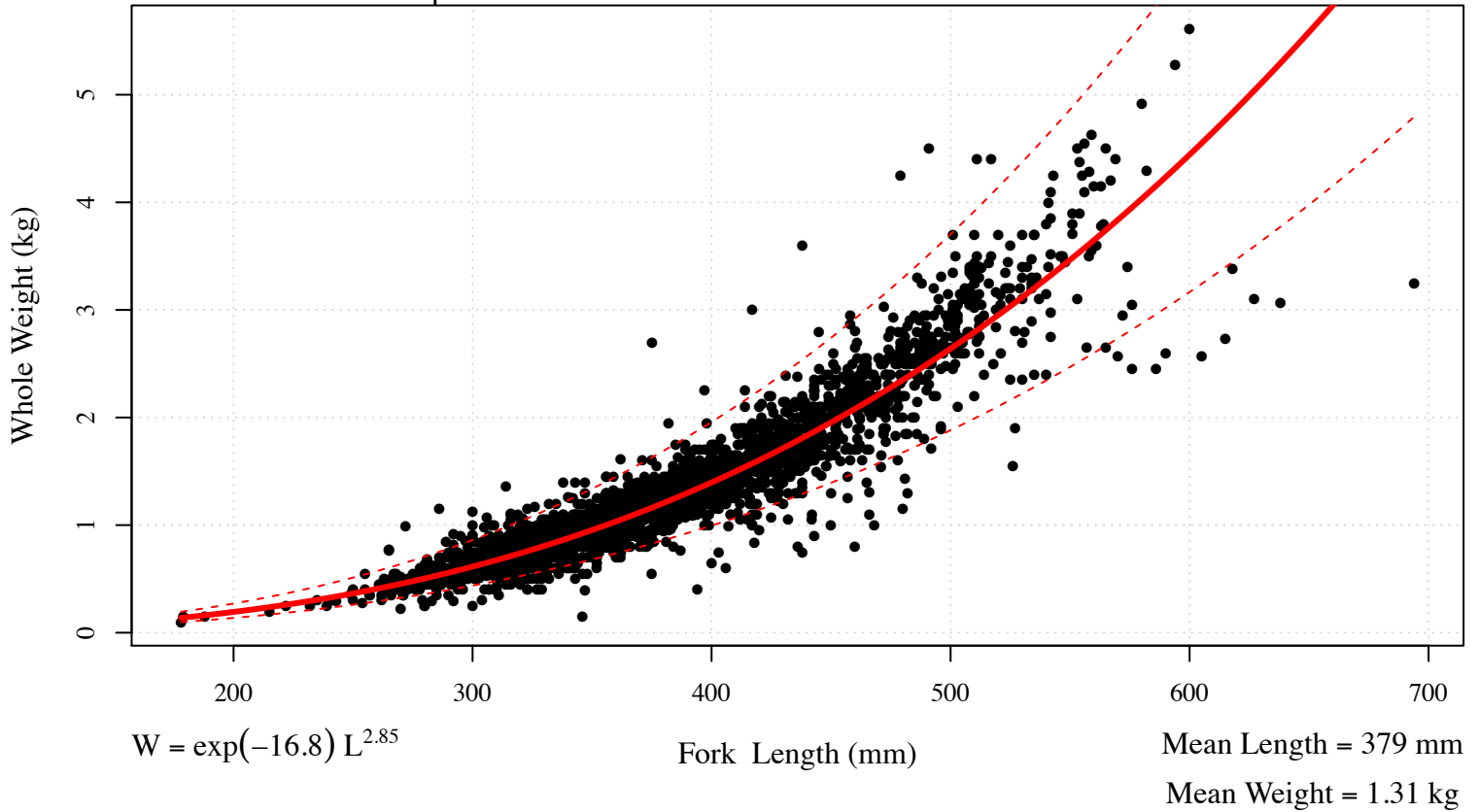
Balistes capriscus

$R^2 = 0.882$

N = 3,211

RSE = 0.173

Most common fate is kept



More common in the Eastern Gulf

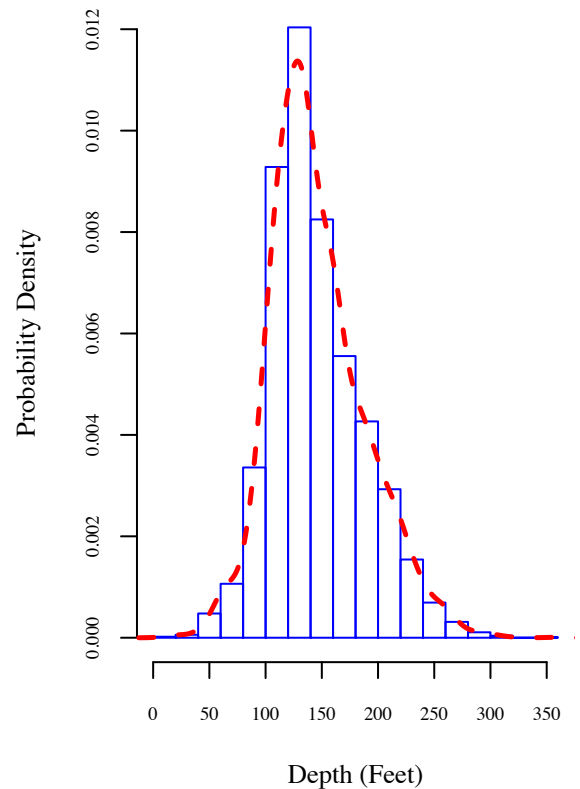
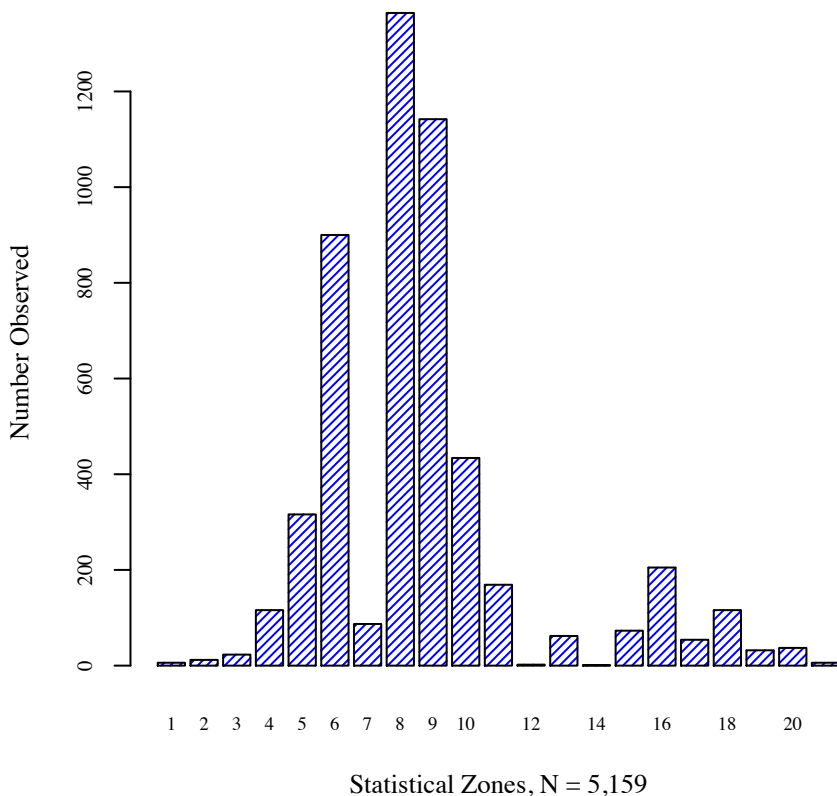


Figure 66 . Regression model, location, and depth information for triggerfish, gray (*Balistes capriscus*).

Sharksucker

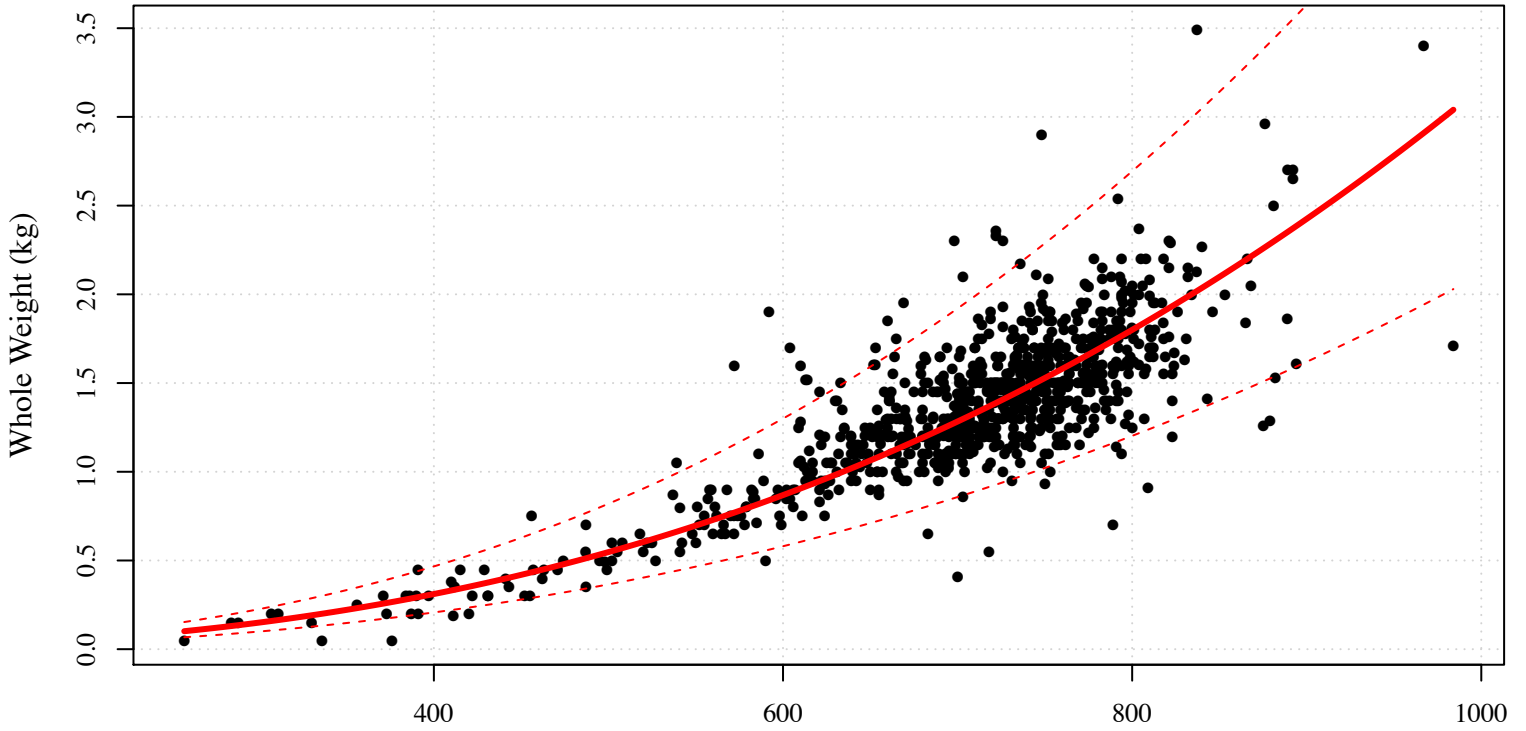
Echeneis naucrates

$R^2 = 0.795$

N = 896

RSE = 0.205

Most common fate is discarded alive



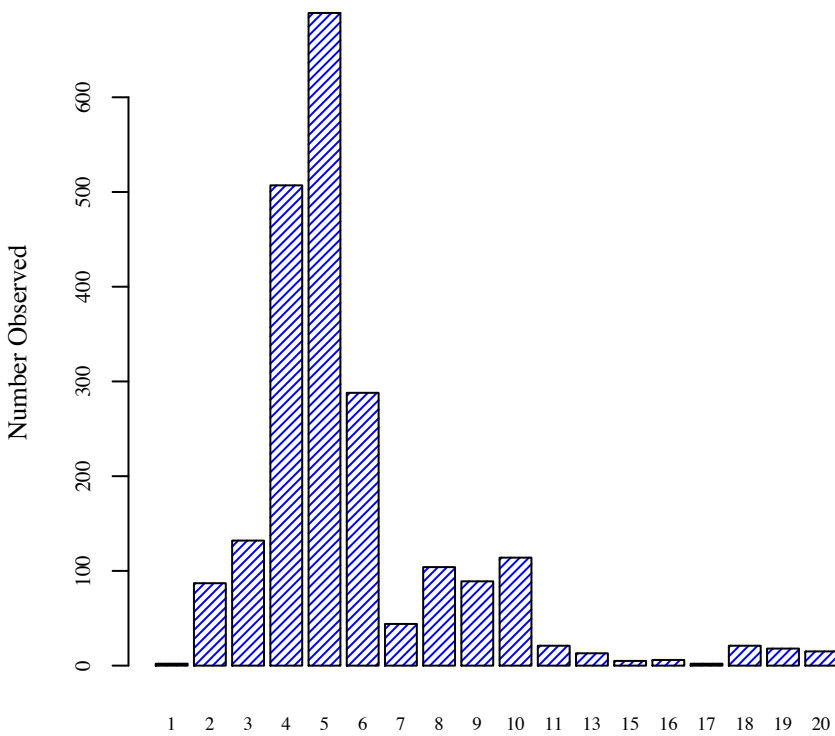
$$W = \exp(-16.3) L^{2.53}$$

Total Length (mm)

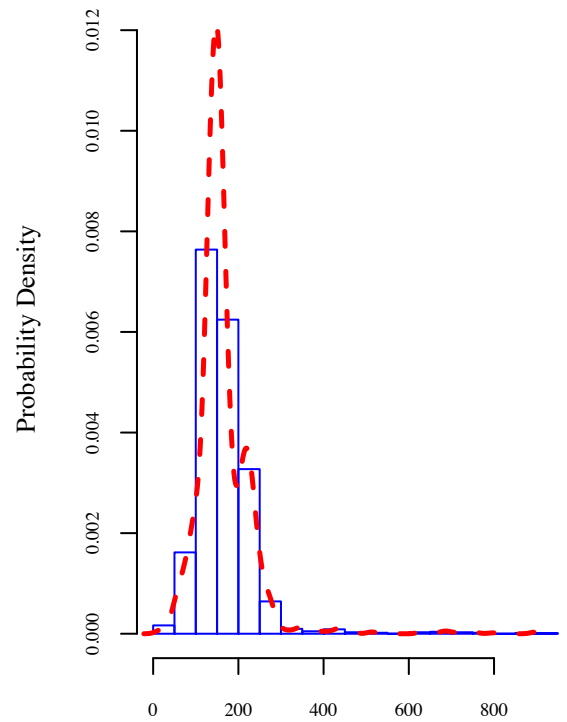
Mean Length = 705 mm

Mean Weight = 1.37 kg

More common in the Eastern Gulf

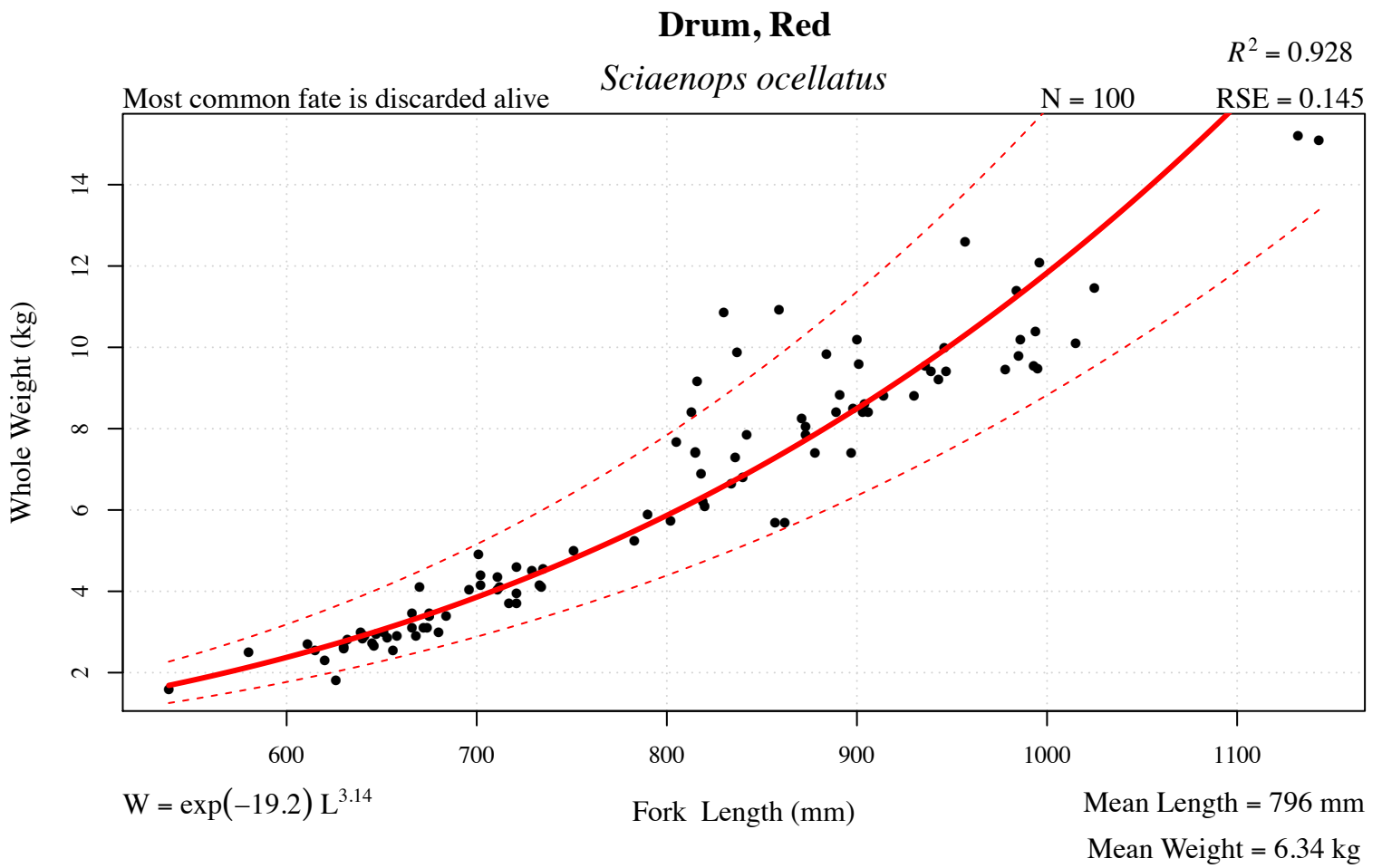


Statistical Zones, N = 2,157



Depth (Feet)

Figure 67 . Regression model, location, and depth information for sharksucker (*Echeneis naucrates*).



More common in the Western Gulf

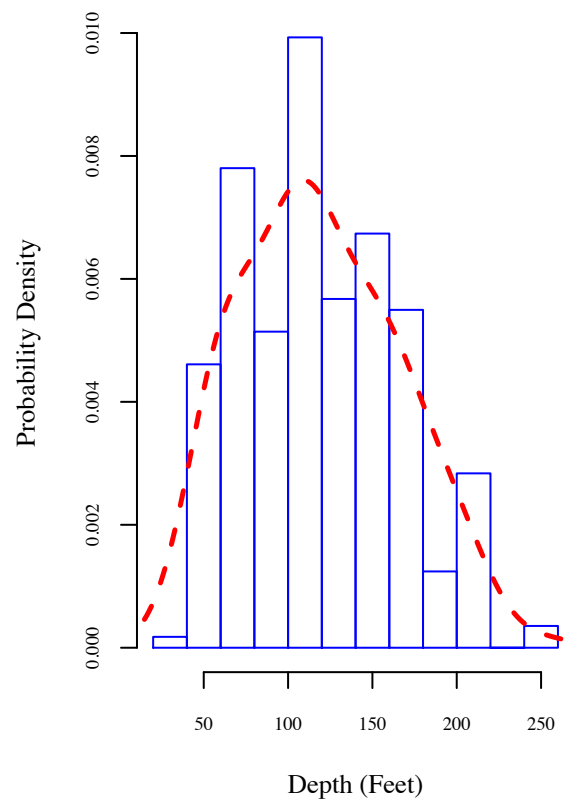
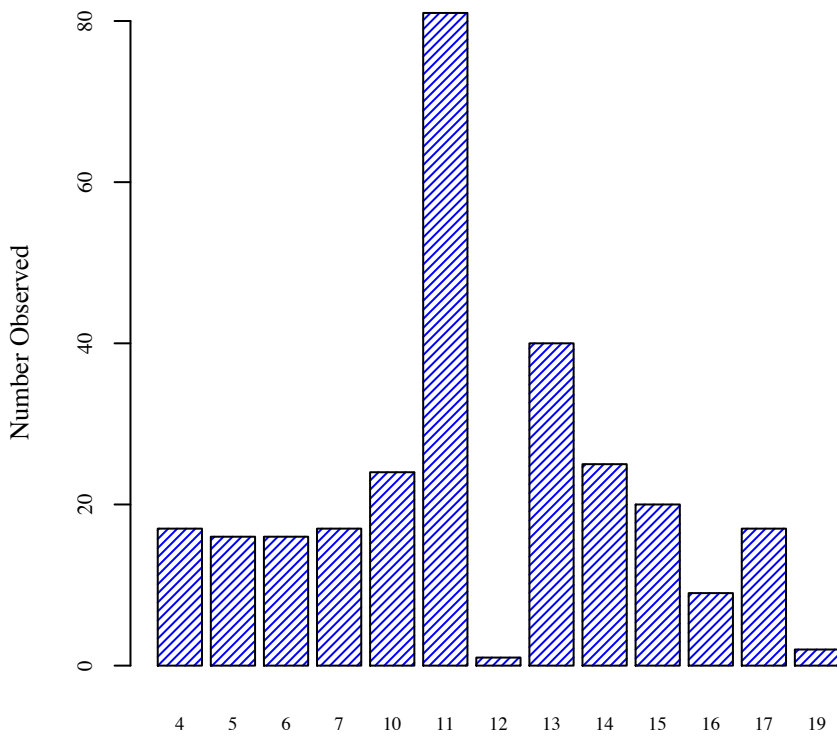
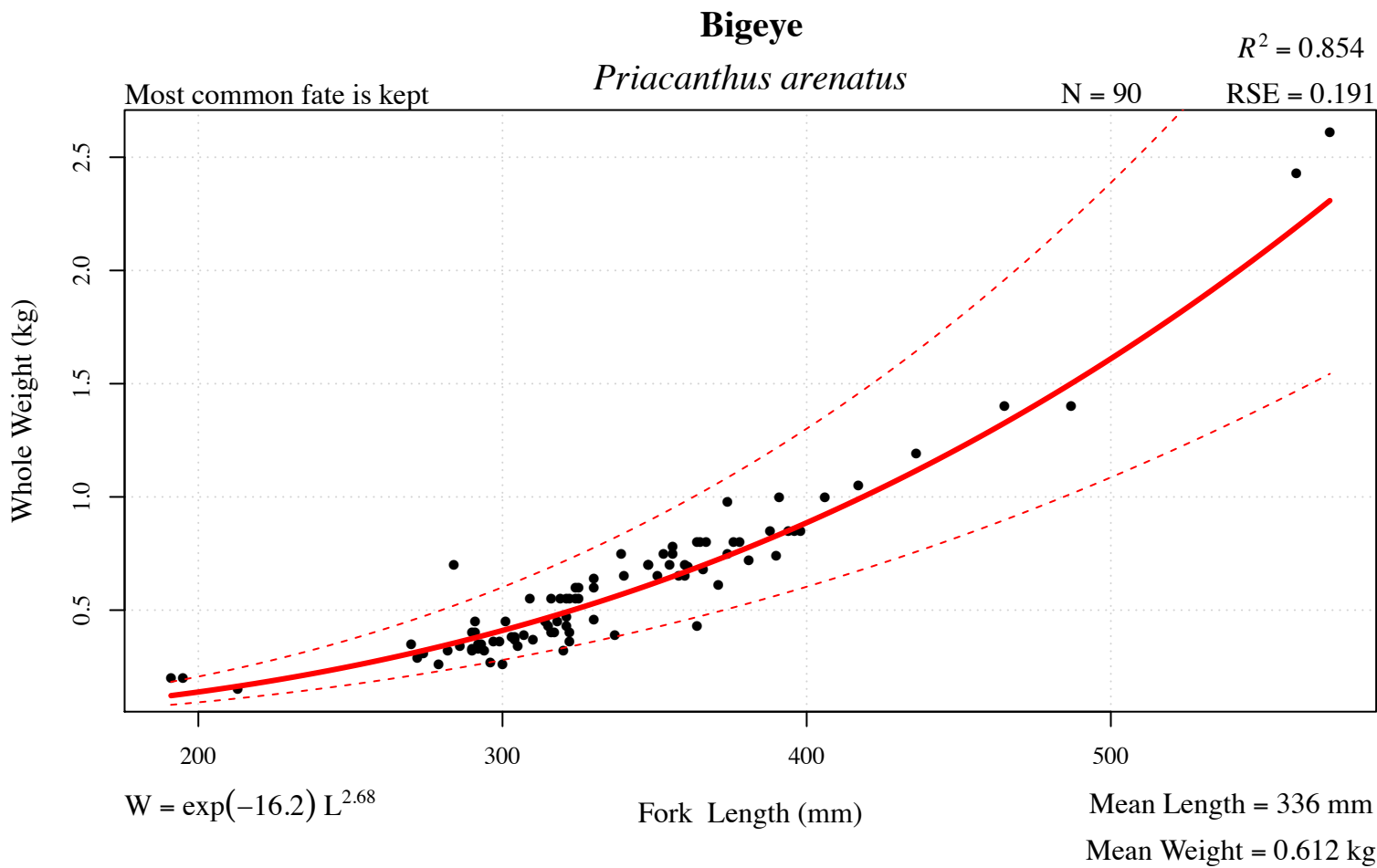


Figure 68 . Regression model, location, and depth information for drum, red (*Sciaenops ocellatus*).



More common in the Western Gulf

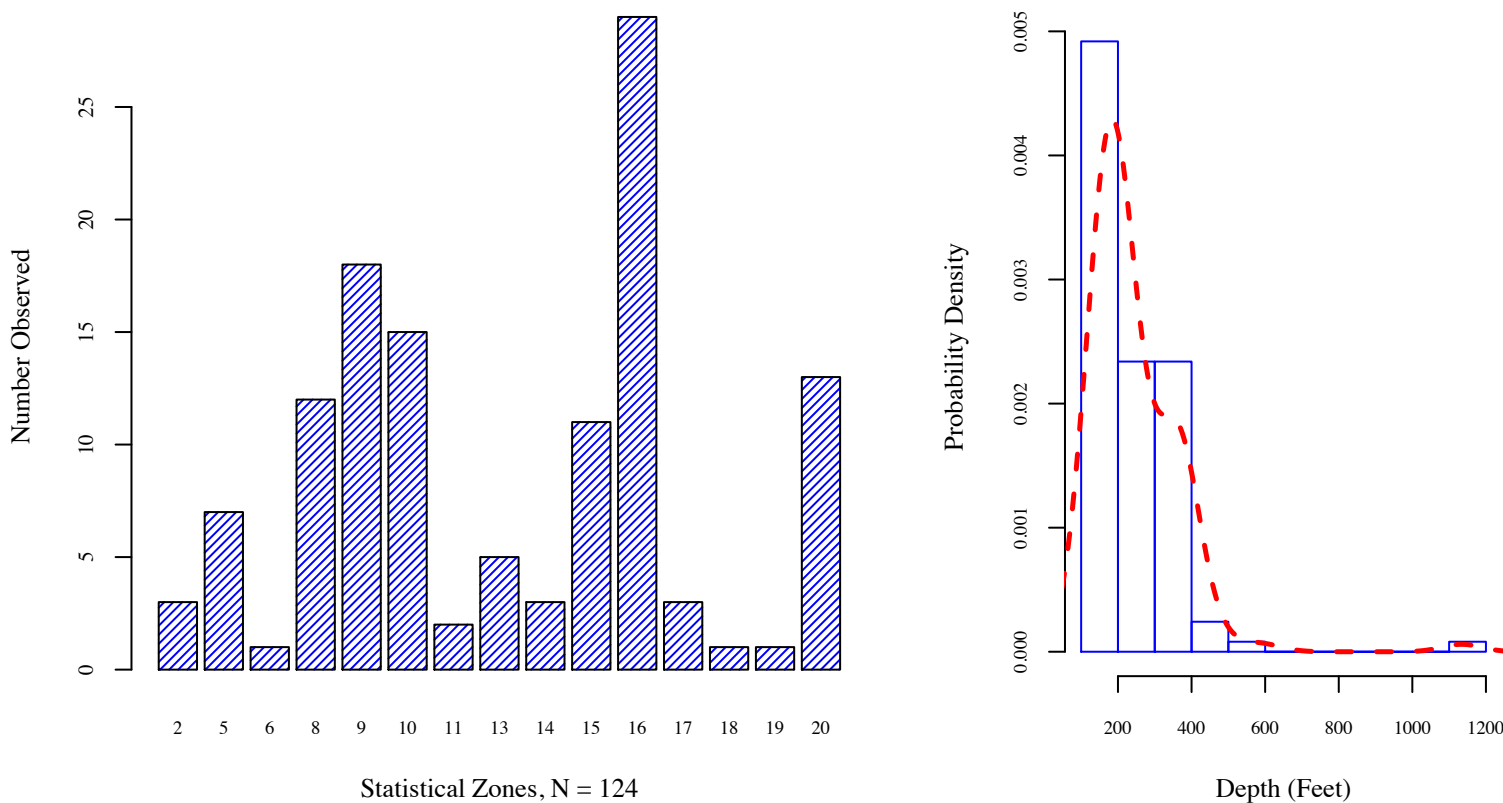
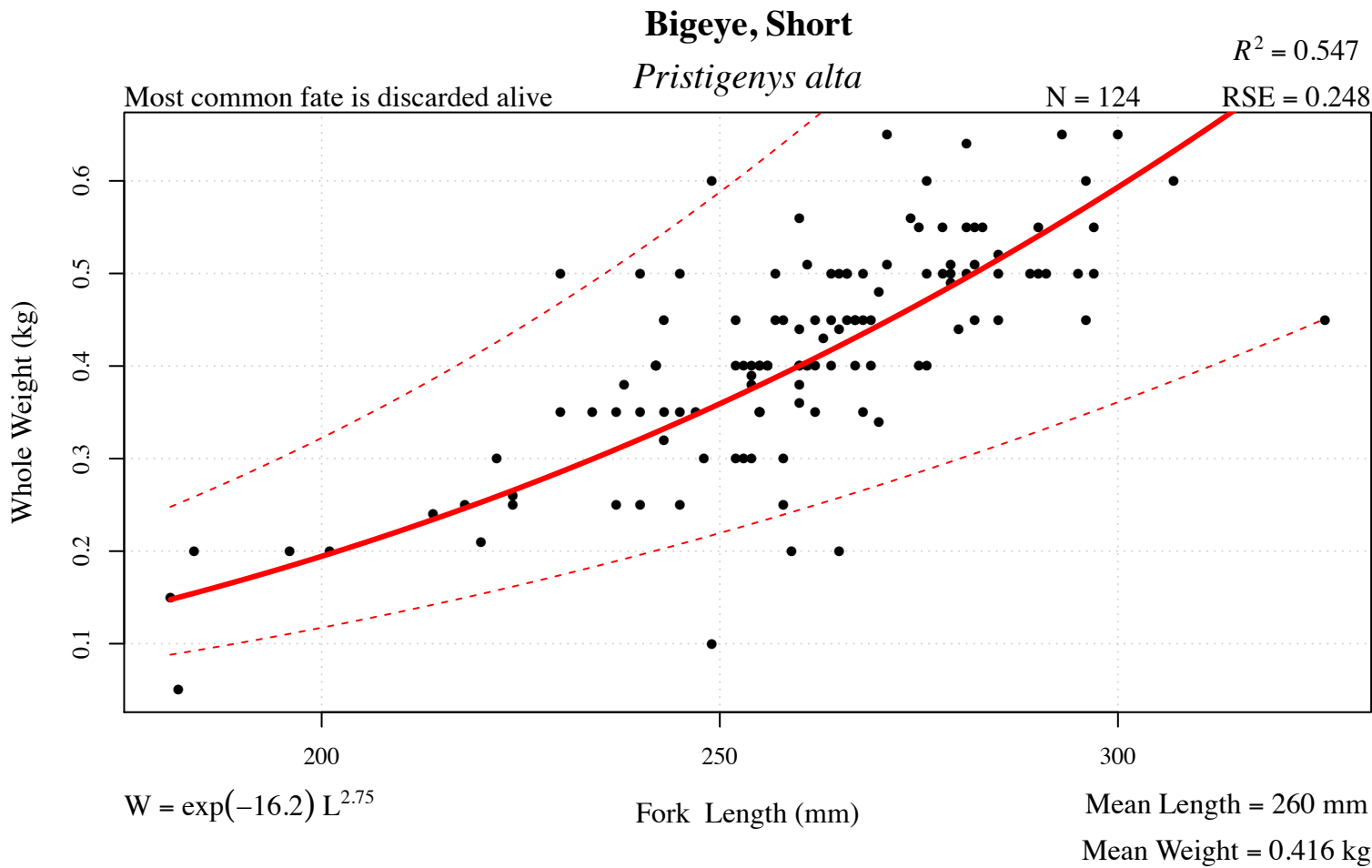


Figure 69 . Regression model, location, and depth information for bigeye (*Priacanthus arenatus*).



More common in the Eastern Gulf

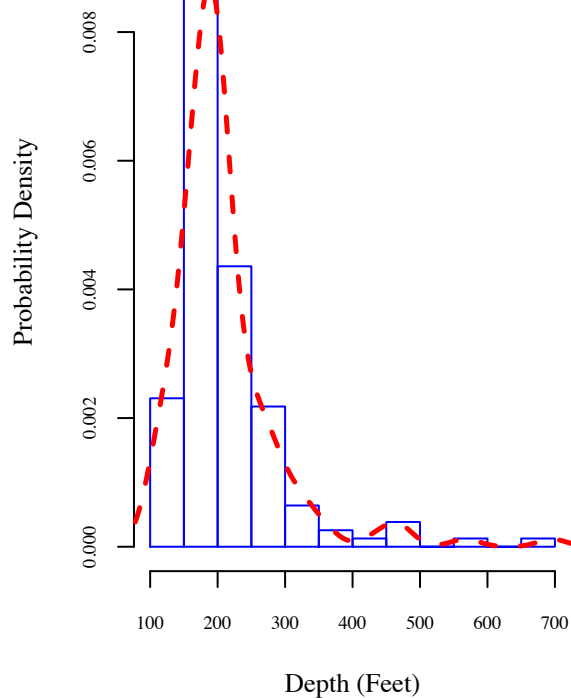
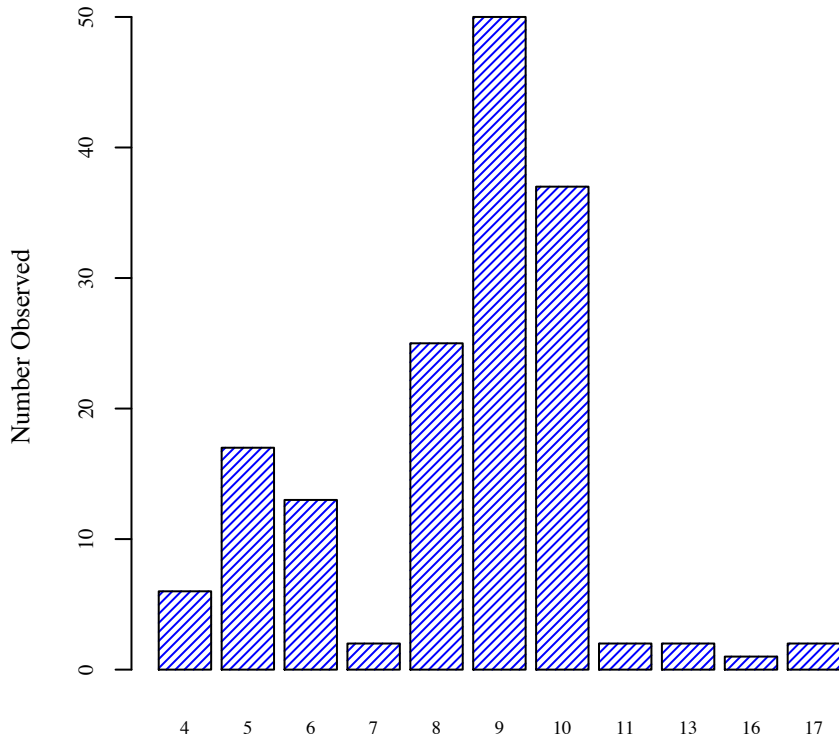


Figure 70 . Regression model, location, and depth information for bigeye, short (*Pristigenys alta*).

Squirrelfish

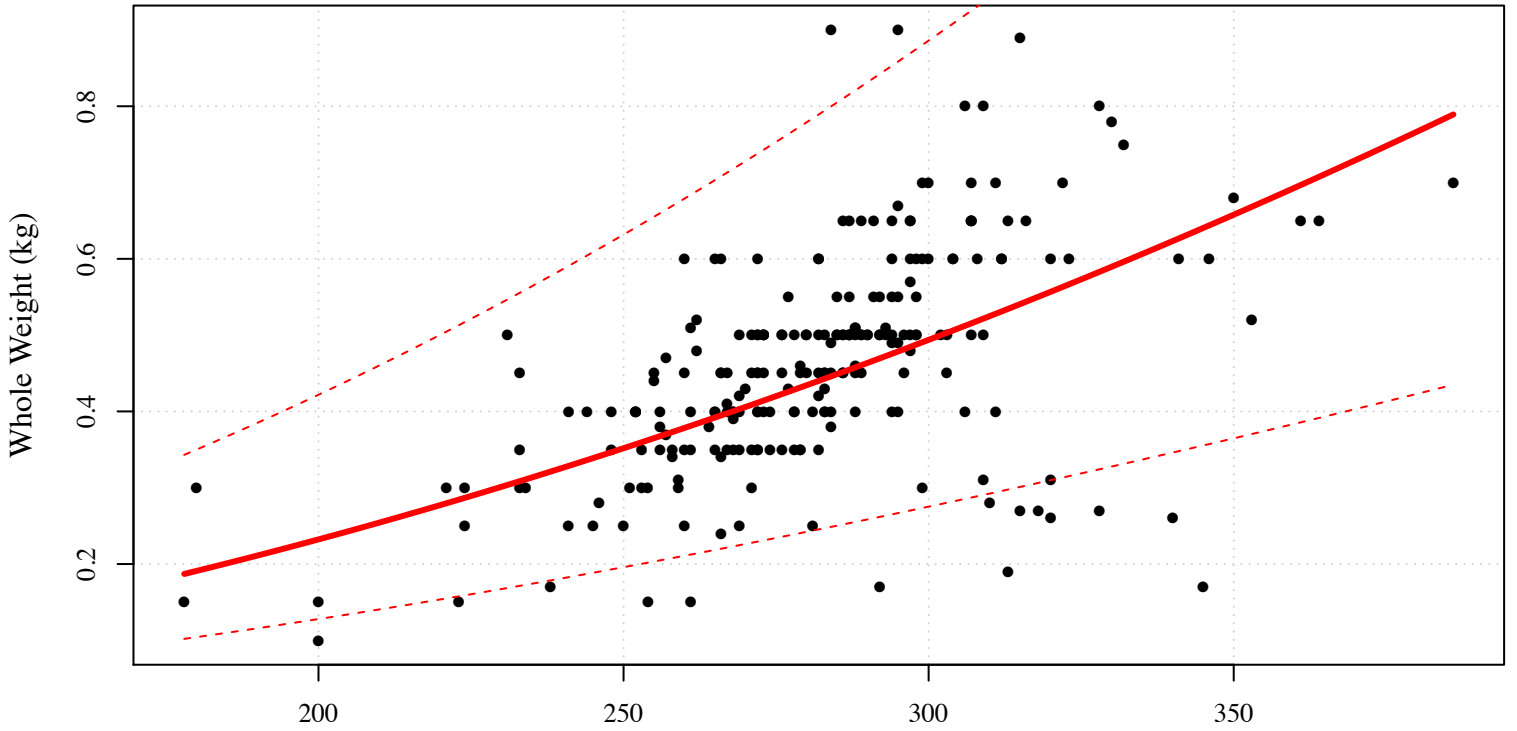
Holocentrus adscensionis

$R^2 = 0.298$

N = 237

RSE = 0.296

Most common fate is discarded alive



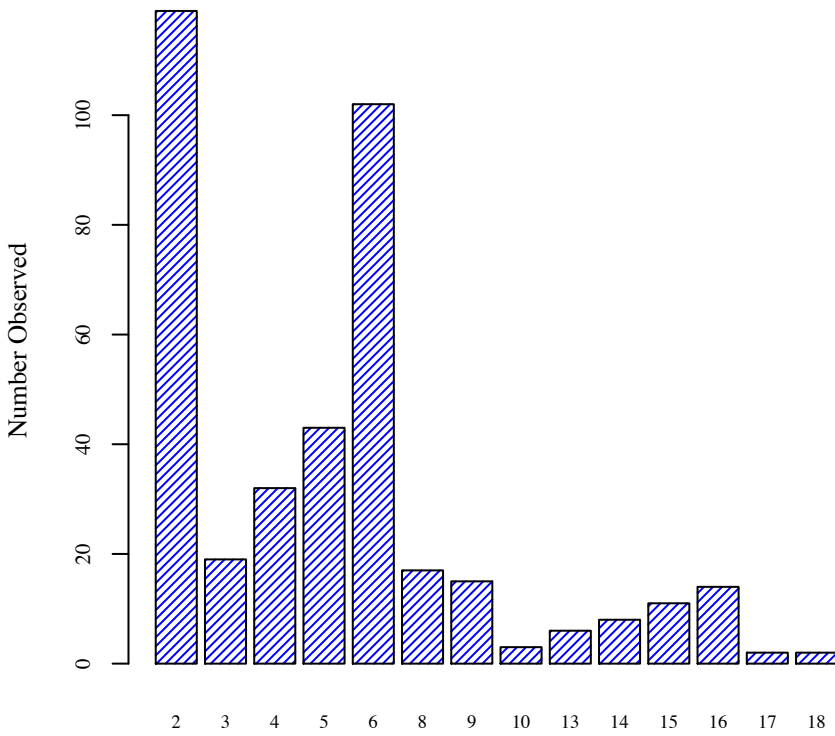
$$W = \exp(-11.3) L^{1.86}$$

Fork Length (mm)

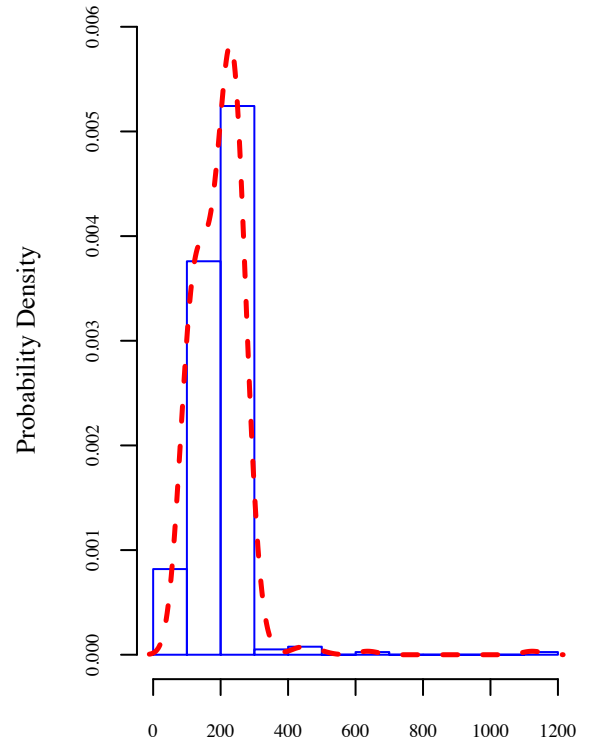
Mean Length = 281 mm

Mean Weight = 0.459 kg

More common in the Eastern Gulf



Statistical Zones, N = 393



Depth (Feet)

Figure 71 . Regression model, location, and depth information for squirrelfish (*Holocentrus adscensionis*).

Scorpionfish, Spinycheek

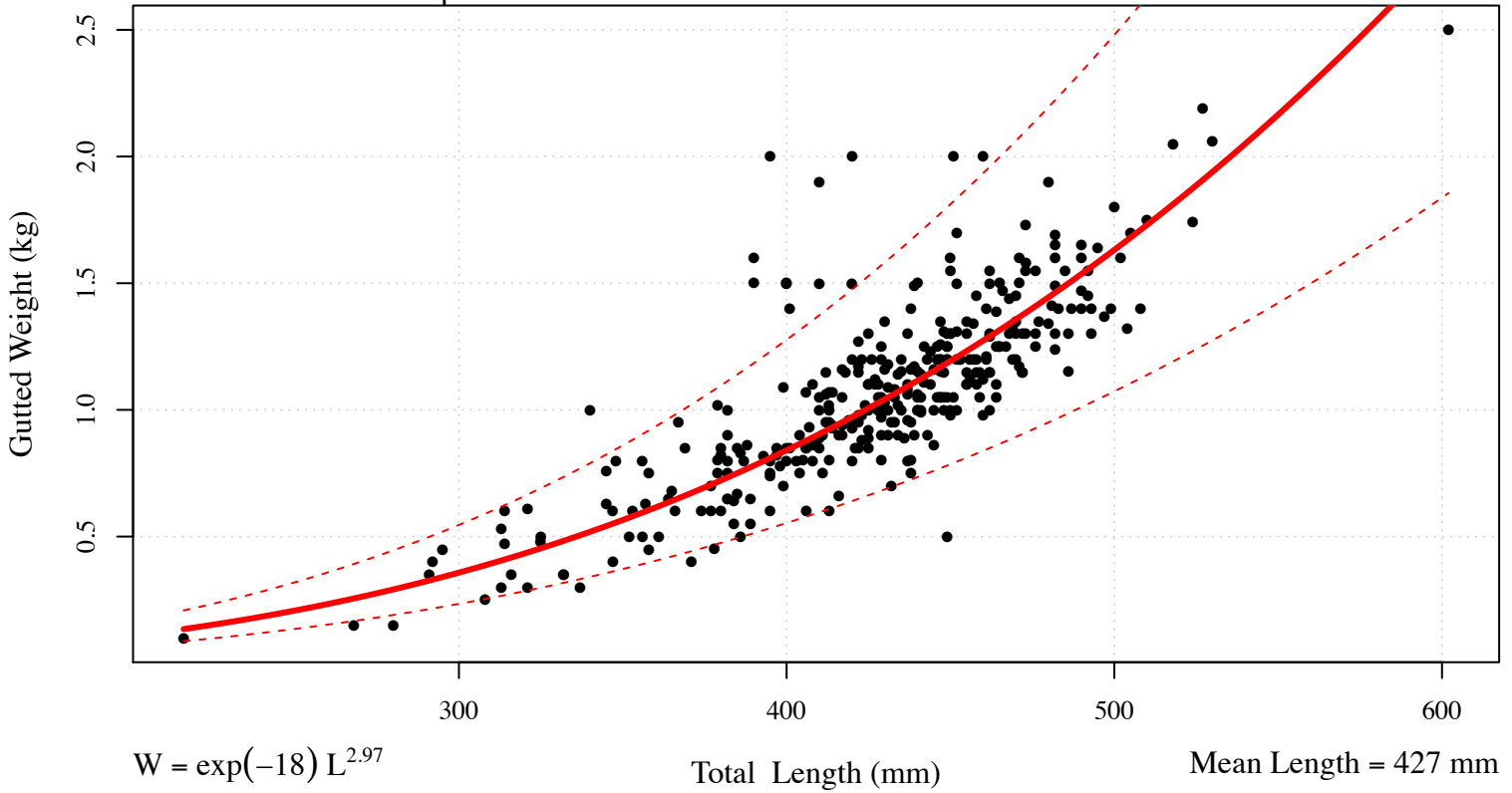
Neomerinthe hemingwayi

$R^2 = 0.738$

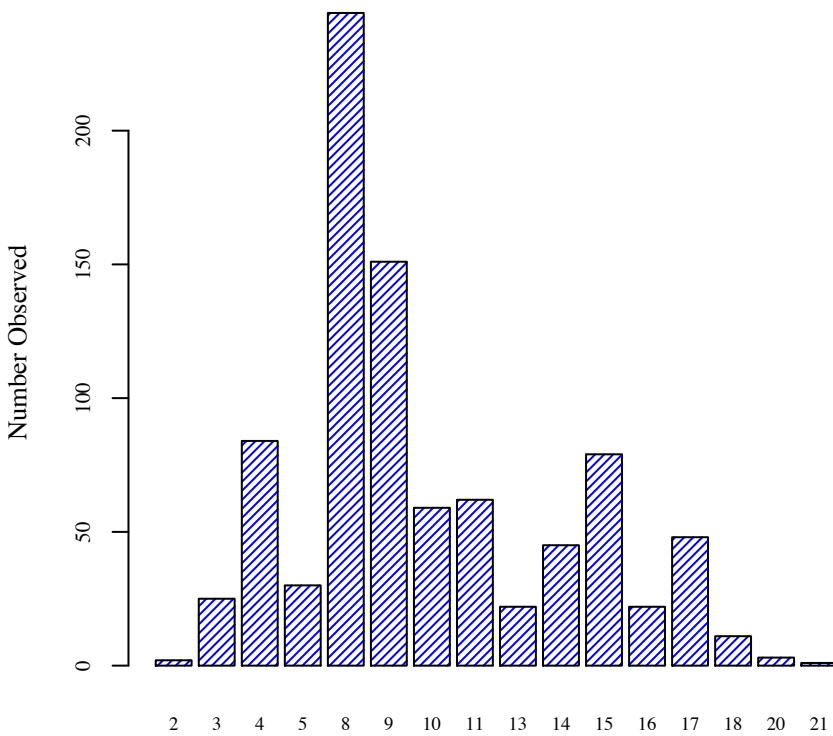
N = 346

RSE = 0.212

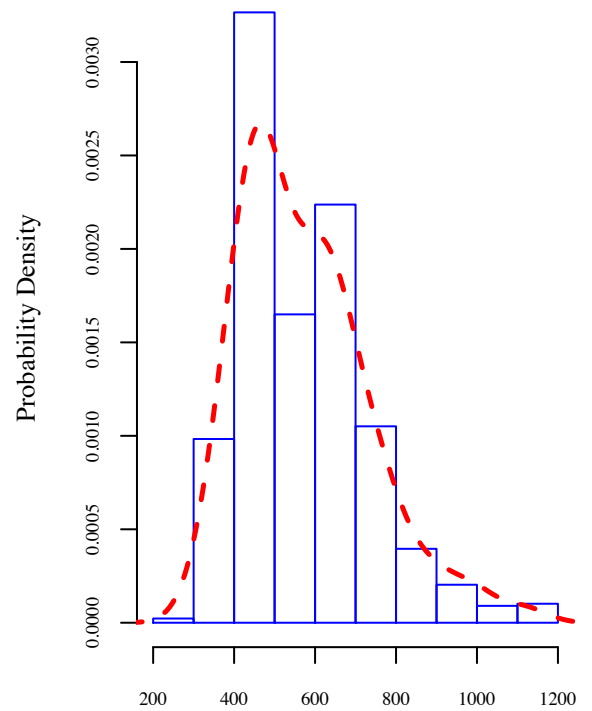
Most common fate is kept



More common in the Eastern Gulf

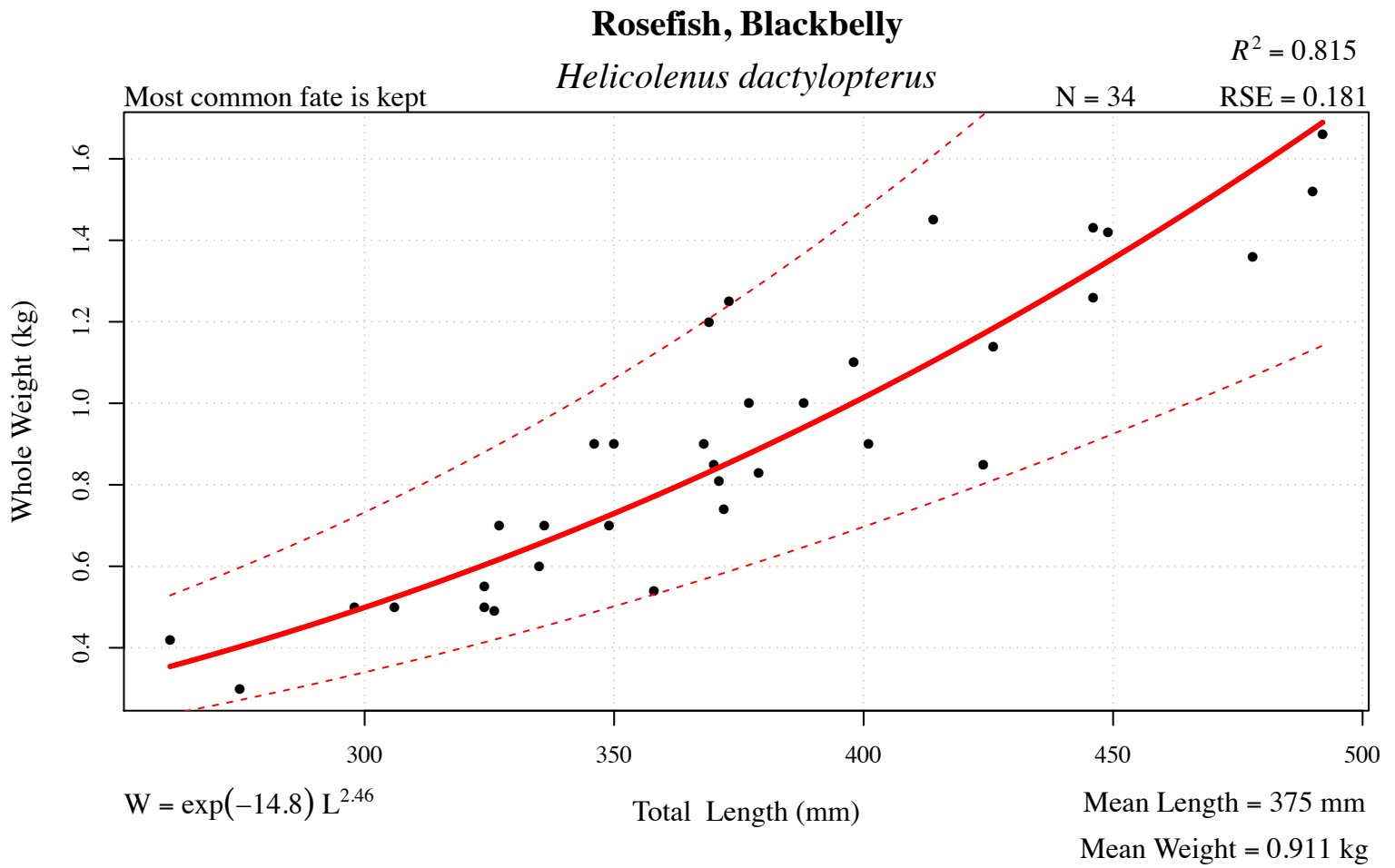


Statistical Zones, N = 888

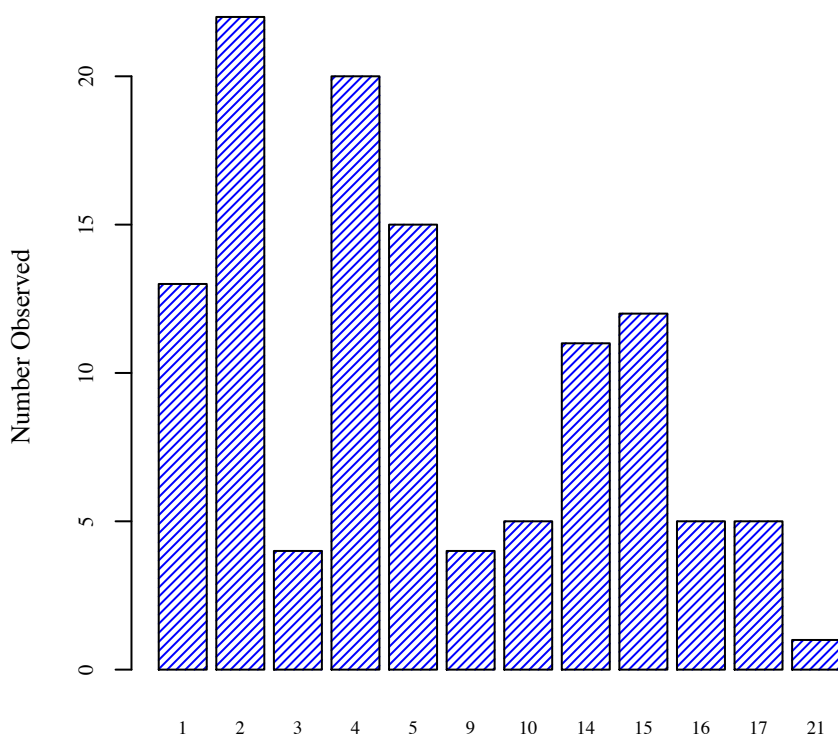


Depth (Feet)

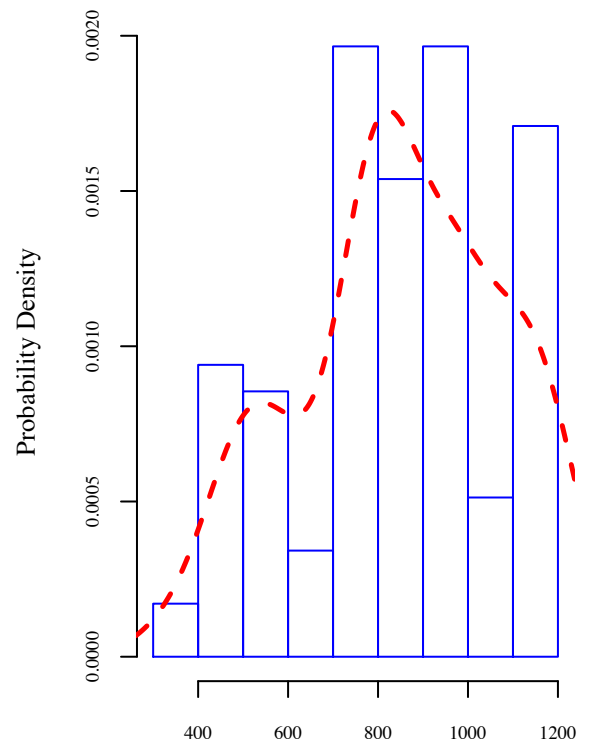
Figure 72 . Regression model, location, and depth information for scorpionfish, spinycheek (*Neomerinthe hemingwayi*).



More common in the Eastern Gulf



Statistical Zones, N = 117



Depth (Feet)

Figure 73 . Regression model, location, and depth information for rosefish, blackbelly (*Helicolenus dactylopterus*).

Lionfish, Red

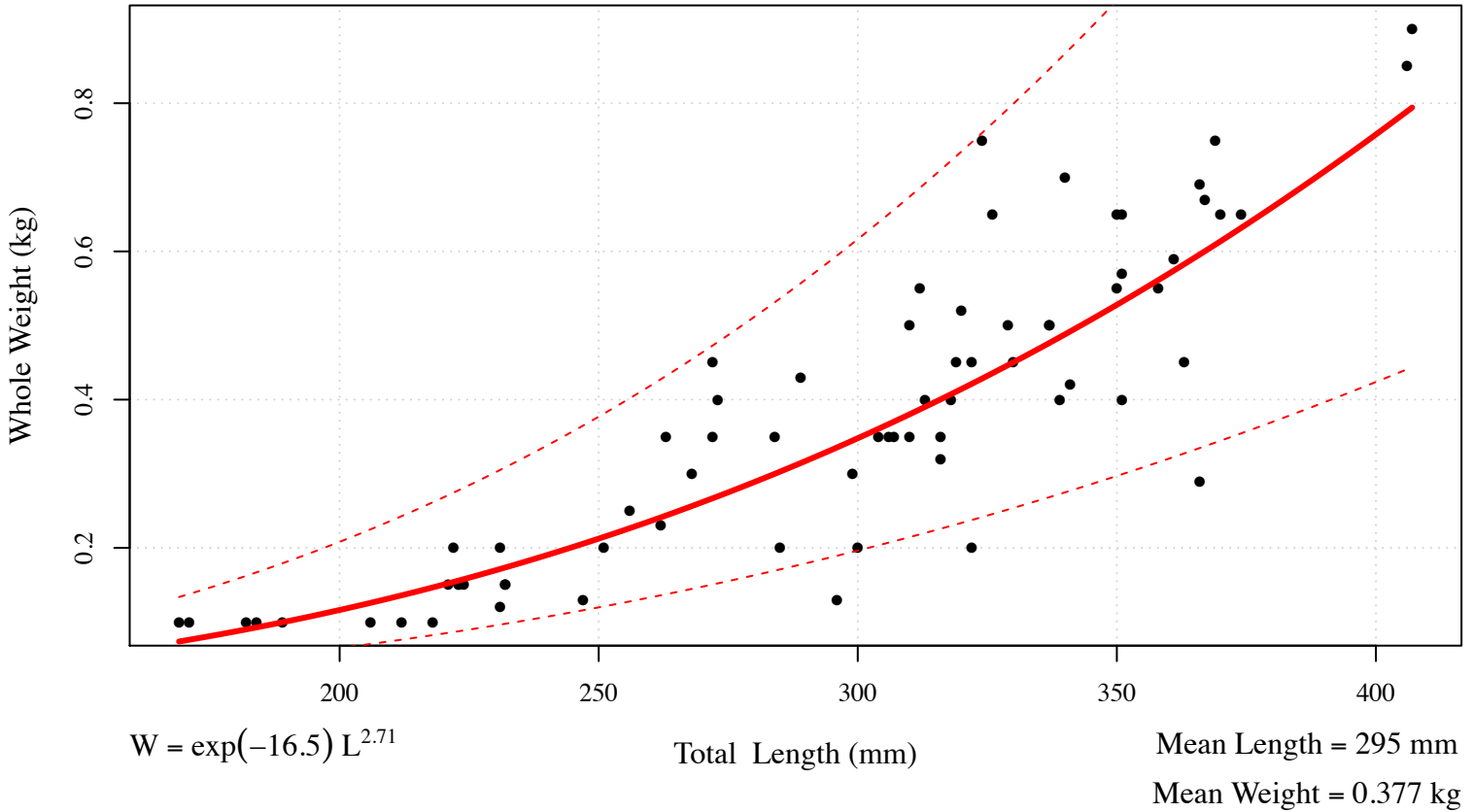
Pterois volitans

$R^2 = 0.809$

N = 71

RSE = 0.285

Most common fate is discarded dead



More common in the Eastern Gulf

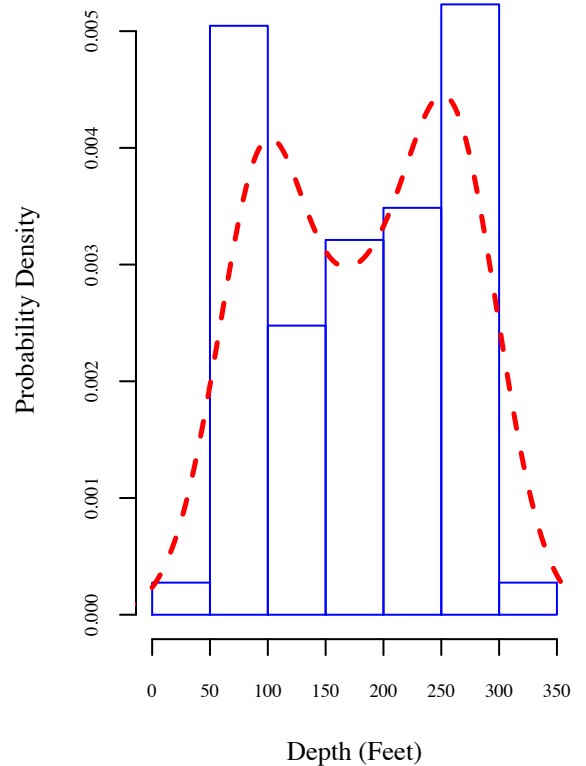
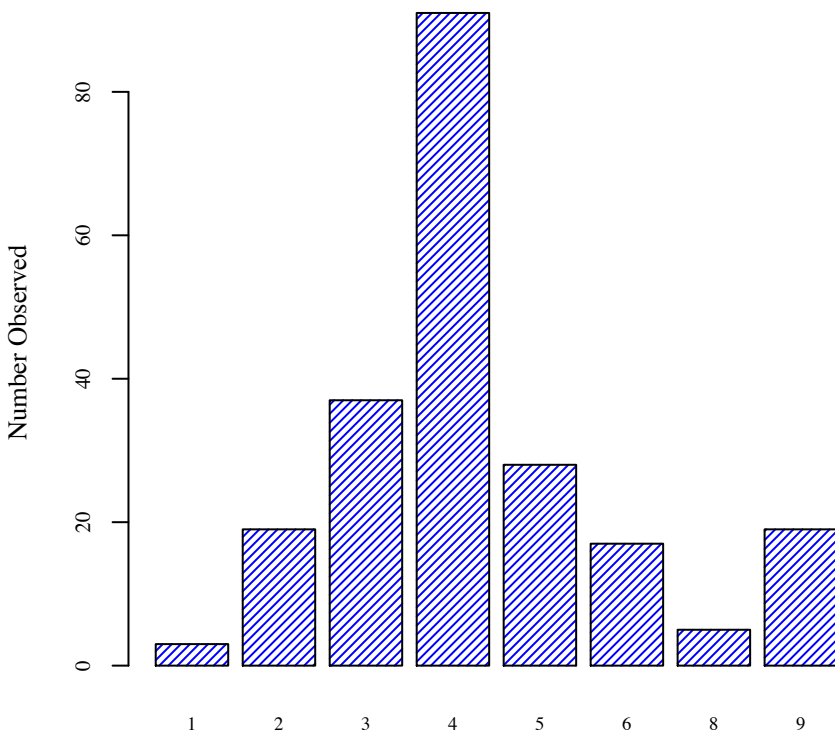
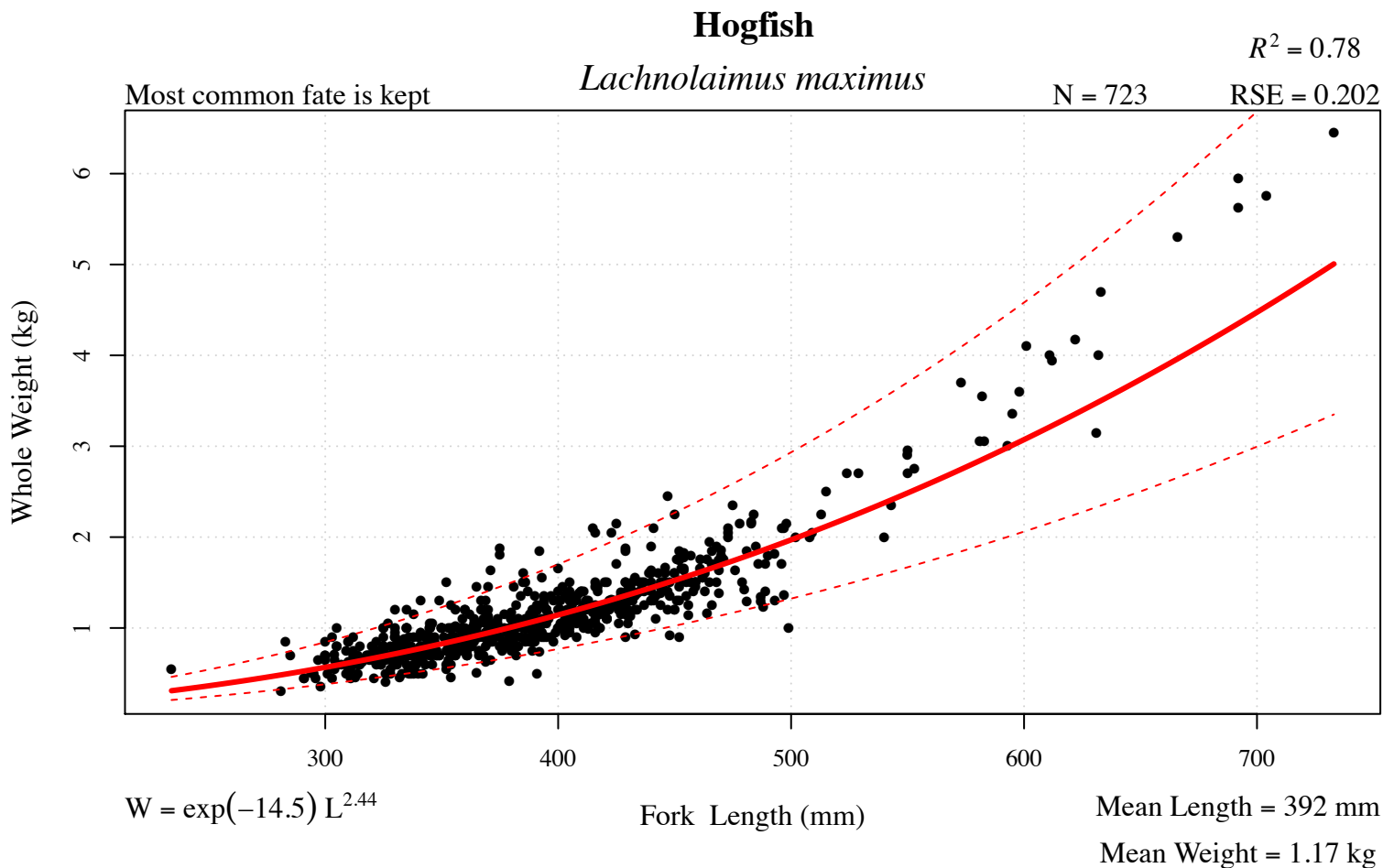


Figure 74 . Regression model, location, and depth information for lionfish, red (*Pterois volitans*).



More common in the Eastern Gulf

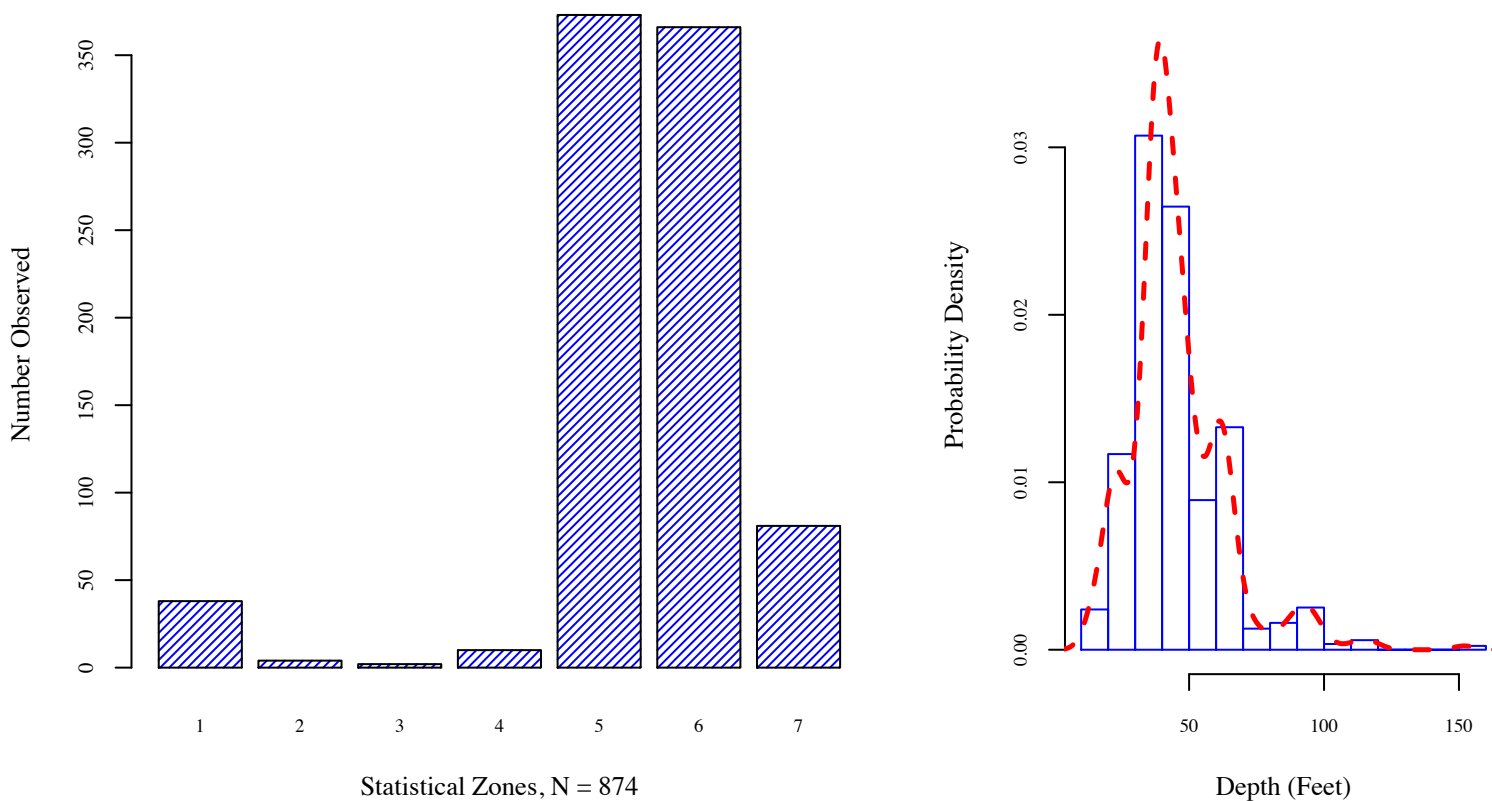
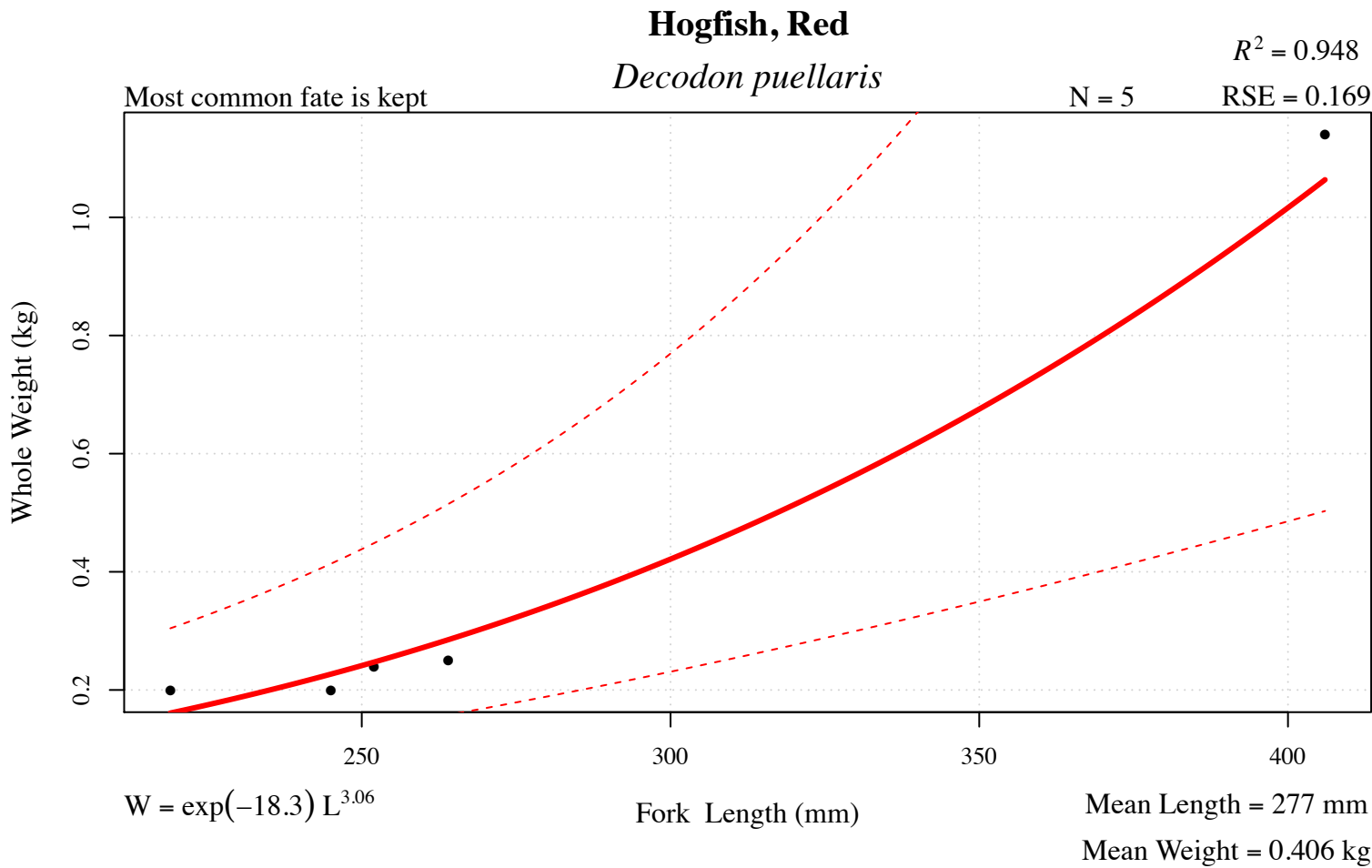


Figure 75 . Regression model, location, and depth information for hogfish (*Lachnolaimus maximus*).



More common in the Eastern Gulf

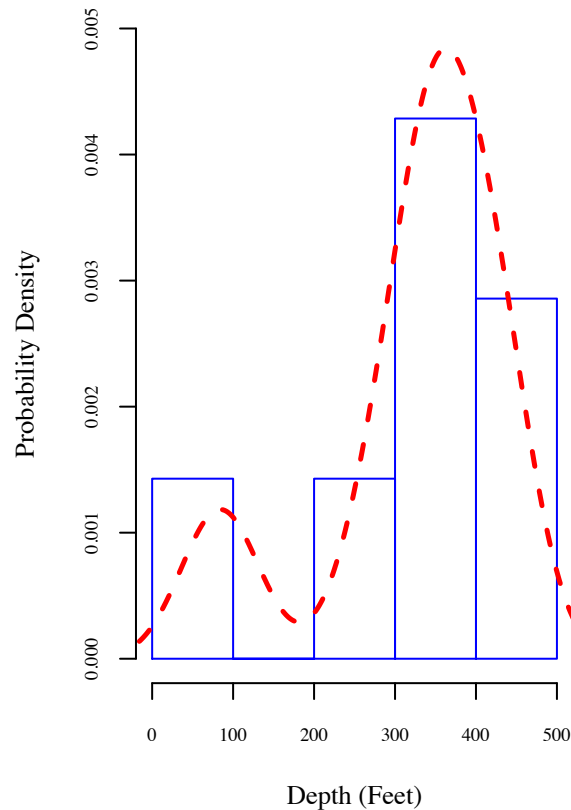
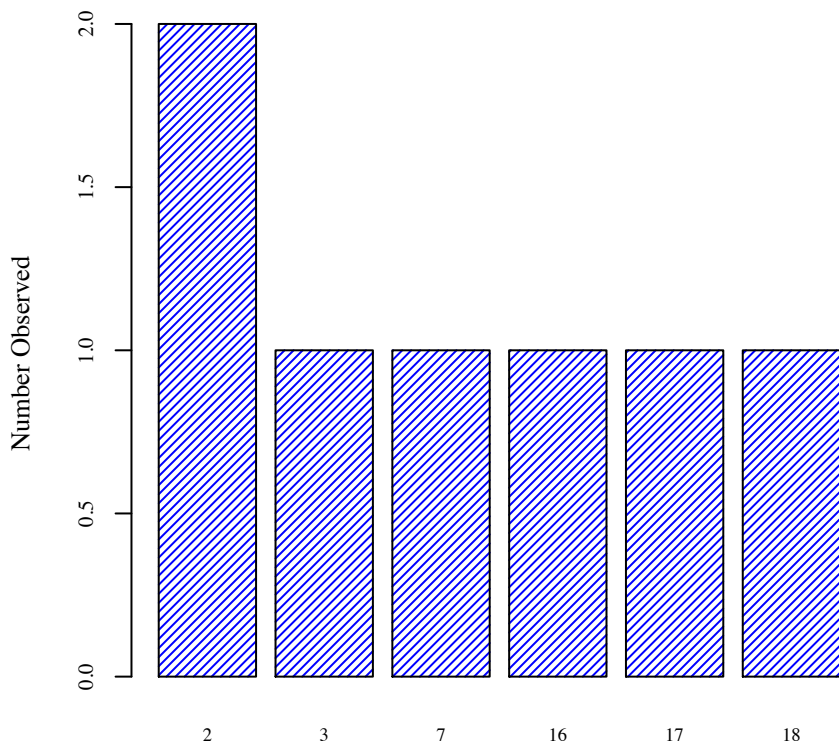


Figure 76 . Regression model, location, and depth information for hogfish, red (*Decodon puellaris*).

Toadfish, Leopard

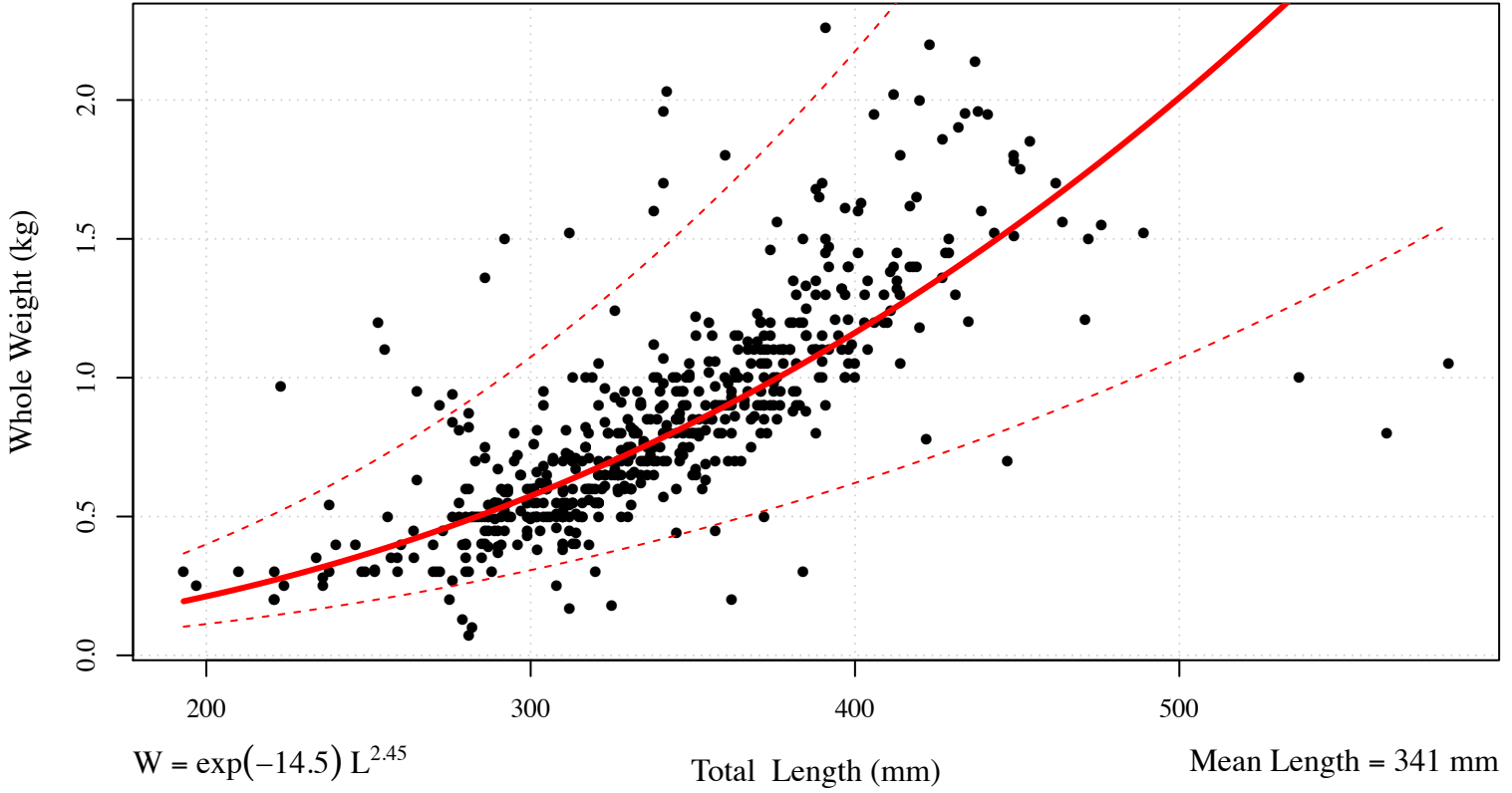
Opsanus pardus

$R^2 = 0.574$

N = 564

RSE = 0.318

Most common fate is used for bait



More common in the Eastern Gulf

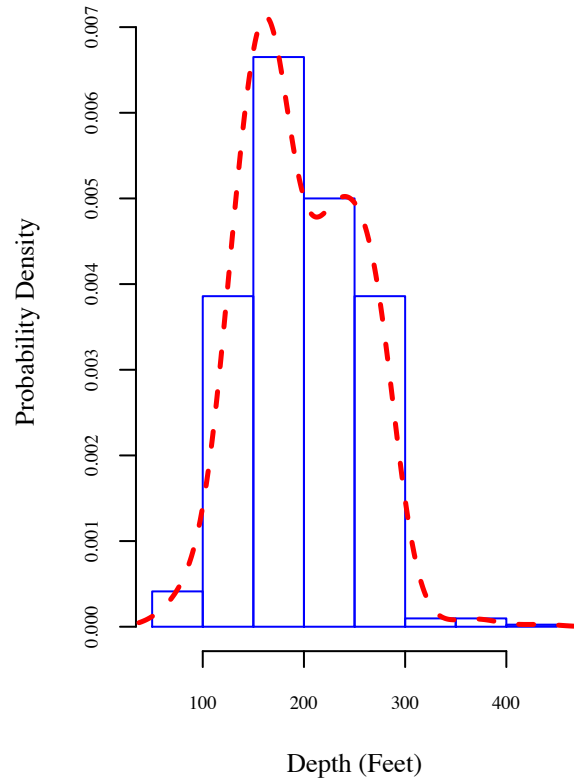
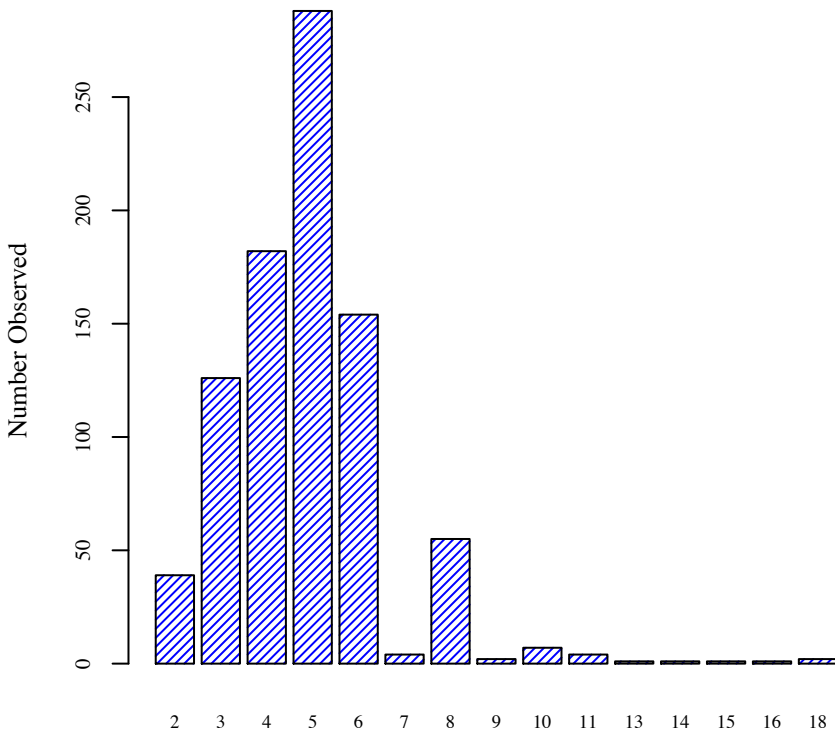


Figure 77 . Regression model, location, and depth information for toadfish, leopard (*Opsanus pardus*).

Lizardfish, Inshore

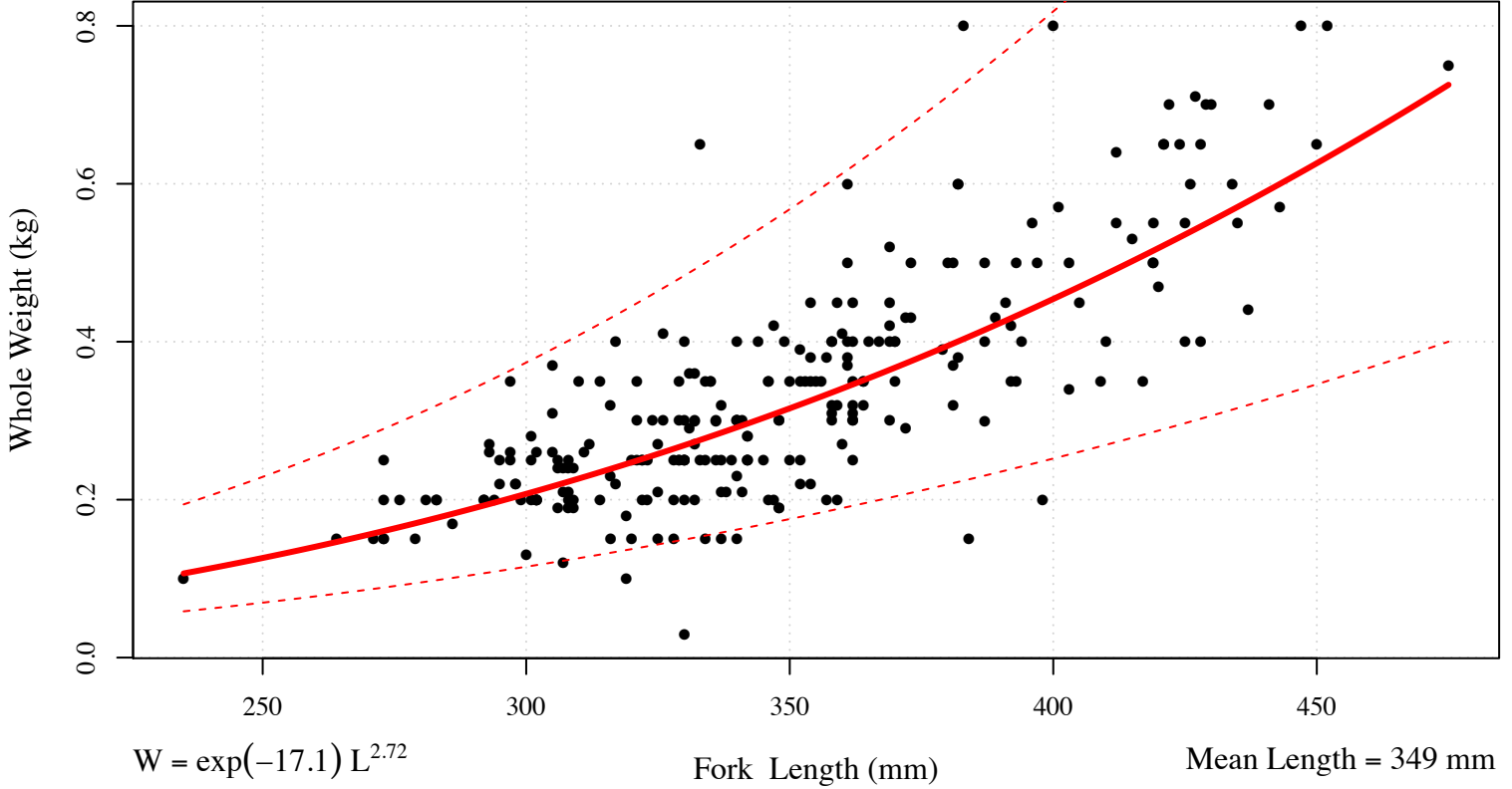
Synodus foetens

$R^2 = 0.549$

N = 256

RSE = 0.298

Most common fate is used for bait



More common in the Eastern Gulf

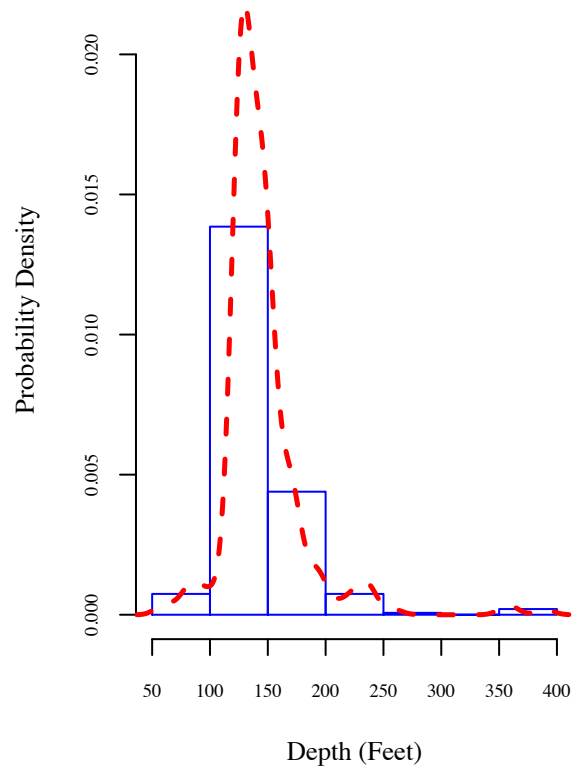
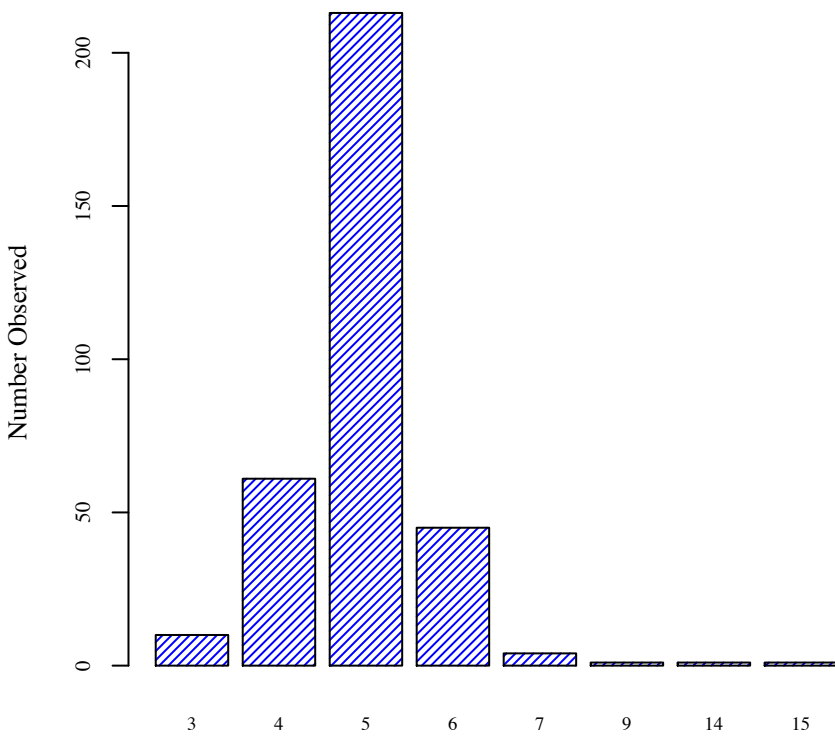


Figure 78 . Regression model, location, and depth information for lizardfish, inshore (*Synodus foetens*).

Snakefish

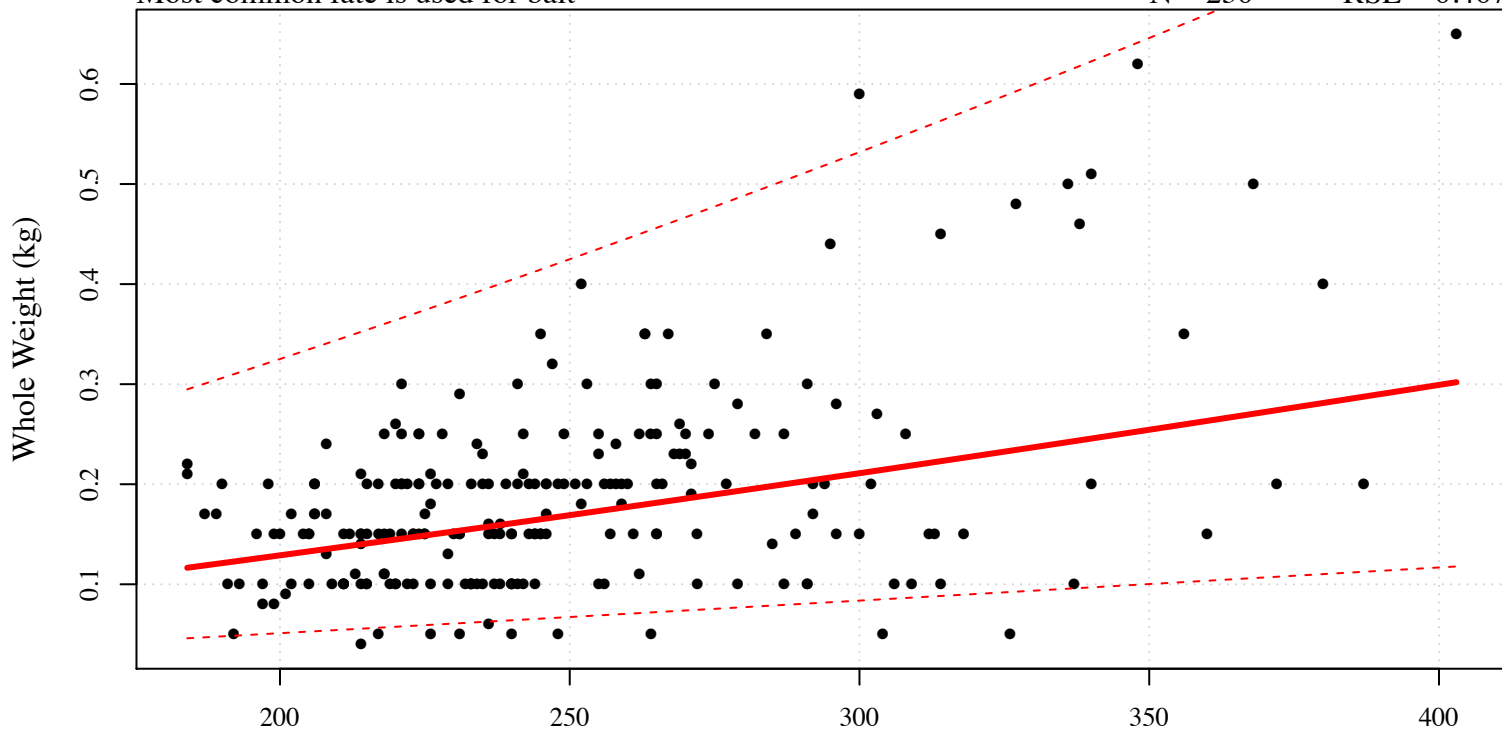
Trachinocephalus myops

$R^2 = 0.138$

RSE = 0.467

N = 230

Most common fate is used for bait



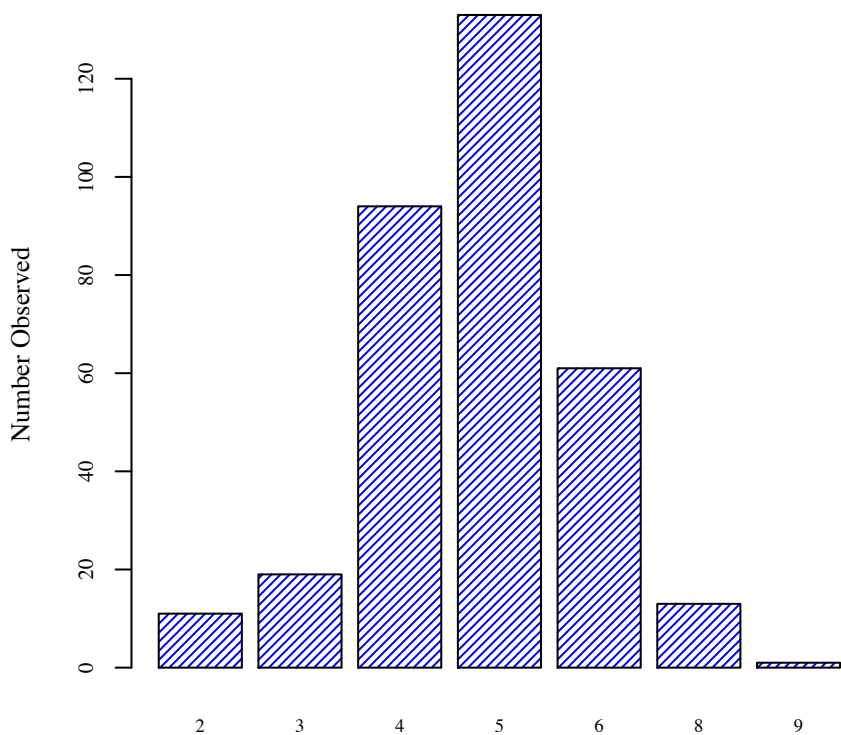
$$W = \exp(-8.48) L^{1.21}$$

Fork Length (mm)

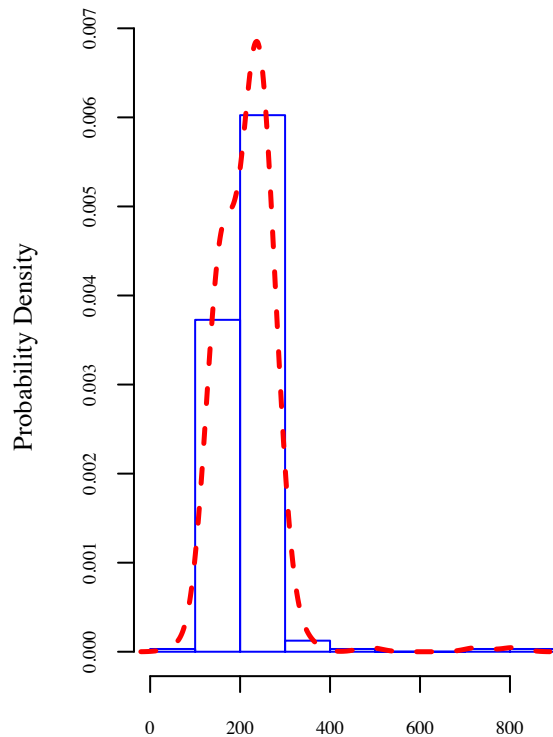
Mean Length = 249 mm

Mean Weight = 0.188 kg

More common in the Eastern Gulf

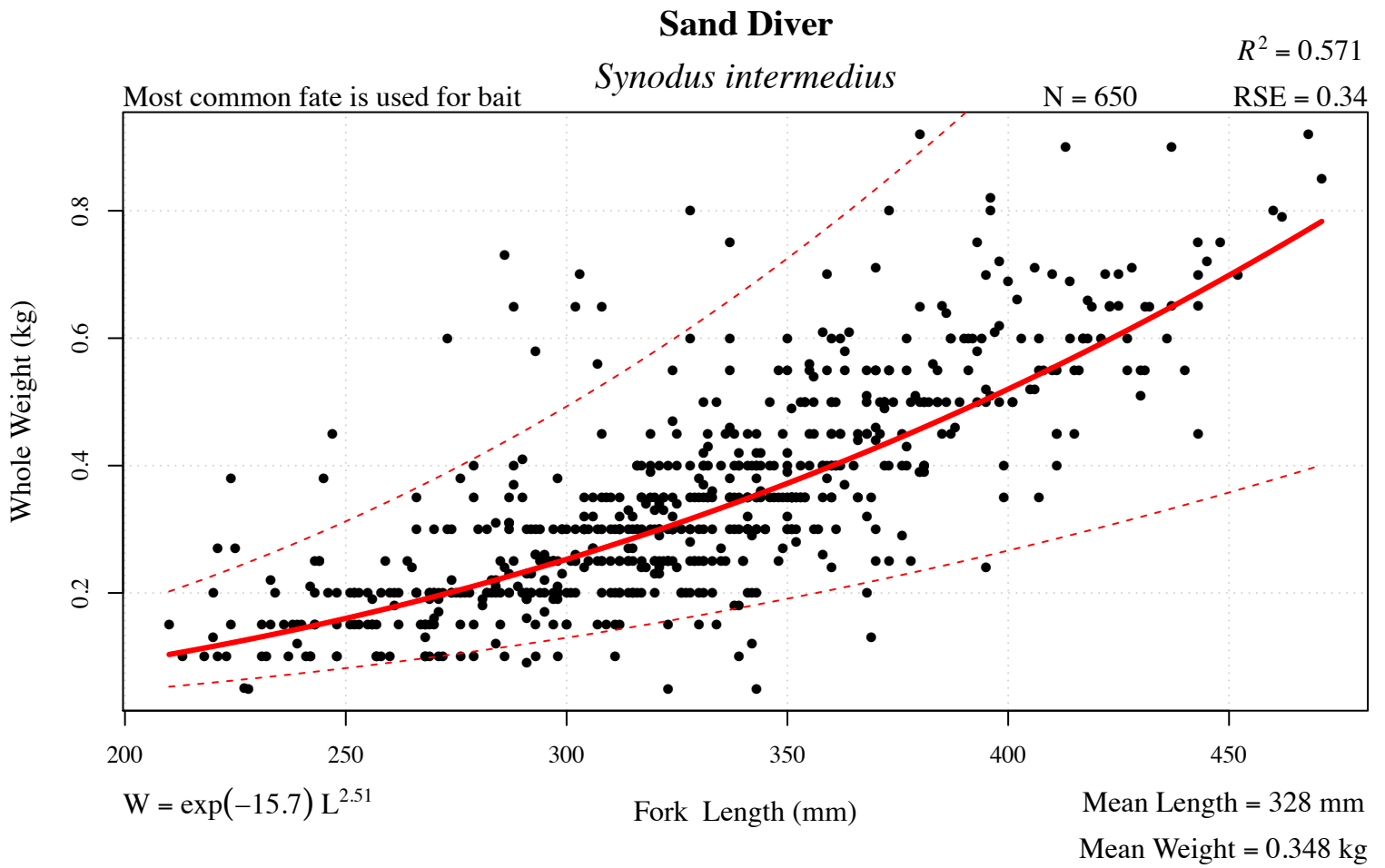


Statistical Zones, N = 332



Depth (Feet)

Figure 79 . Regression model, location, and depth information for snakefish (*Trachinocephalus myops*).



More common in the Eastern Gulf

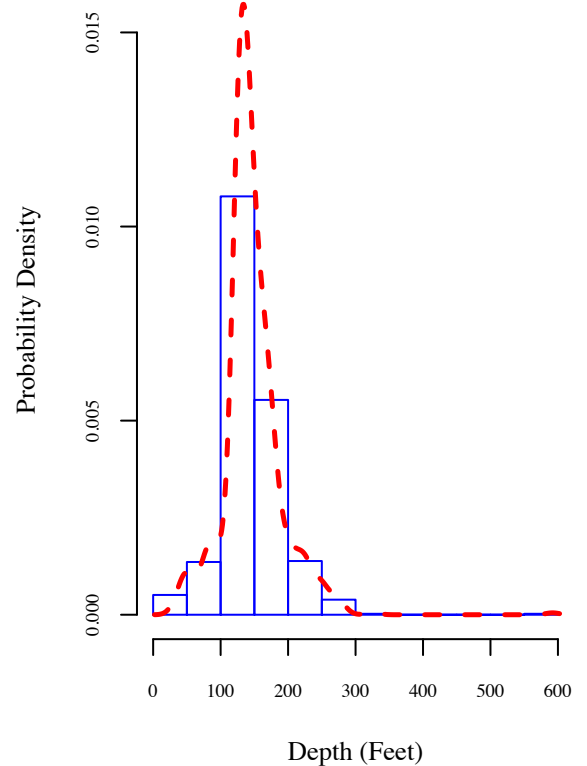
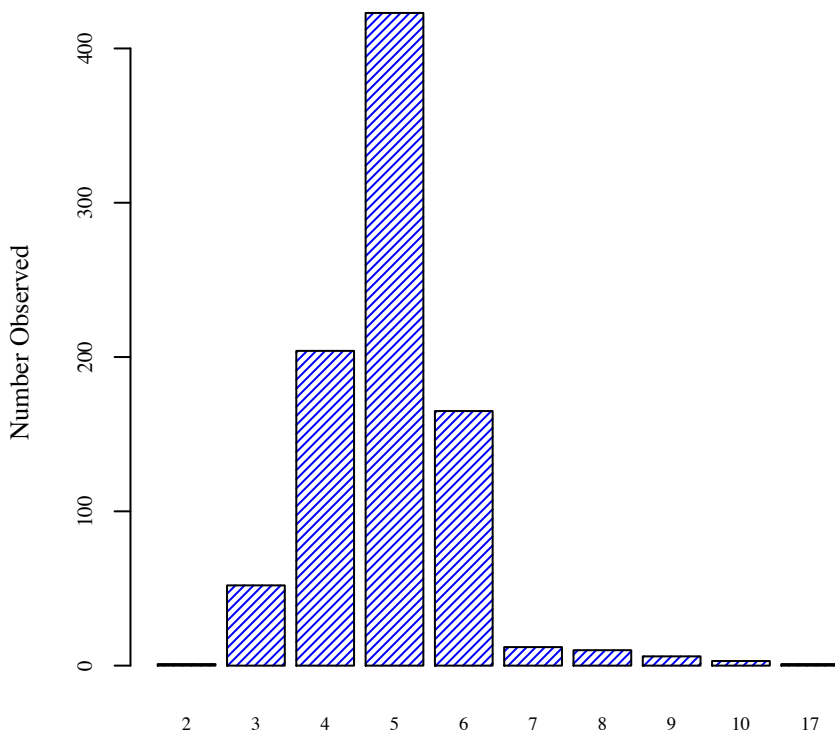


Figure 80 . Regression model, location, and depth information for sand diver (*Synodus intermedius*).

Shark, Bonnethead

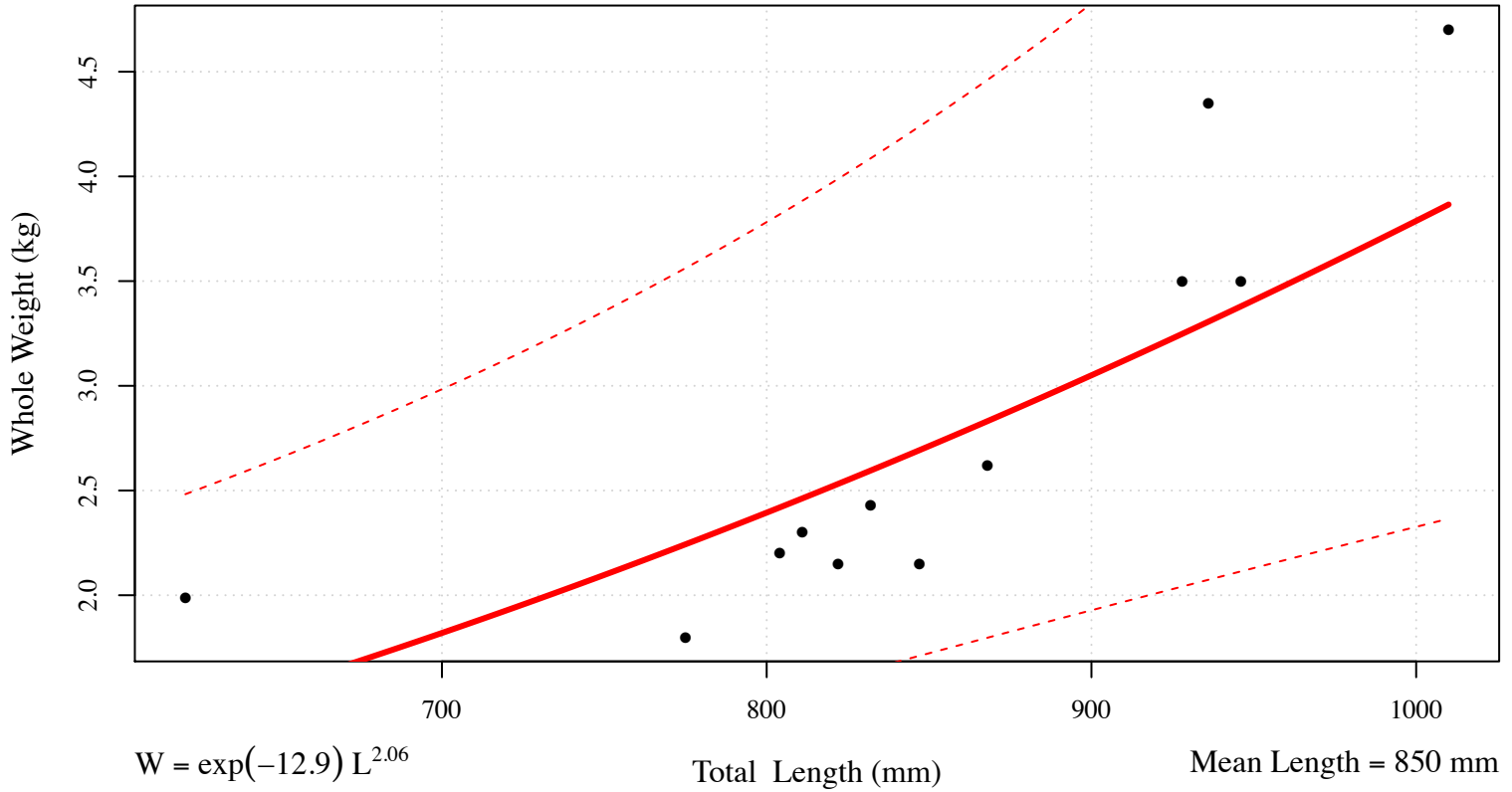
Sphyrna tiburo

$R^2 = 0.621$

N = 12

RSE = 0.196

Most common fate is discarded alive



More common in the Eastern Gulf

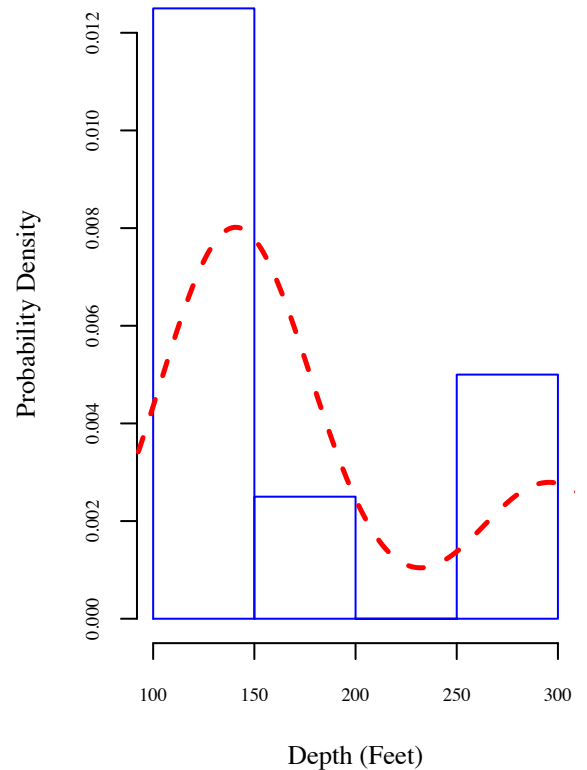
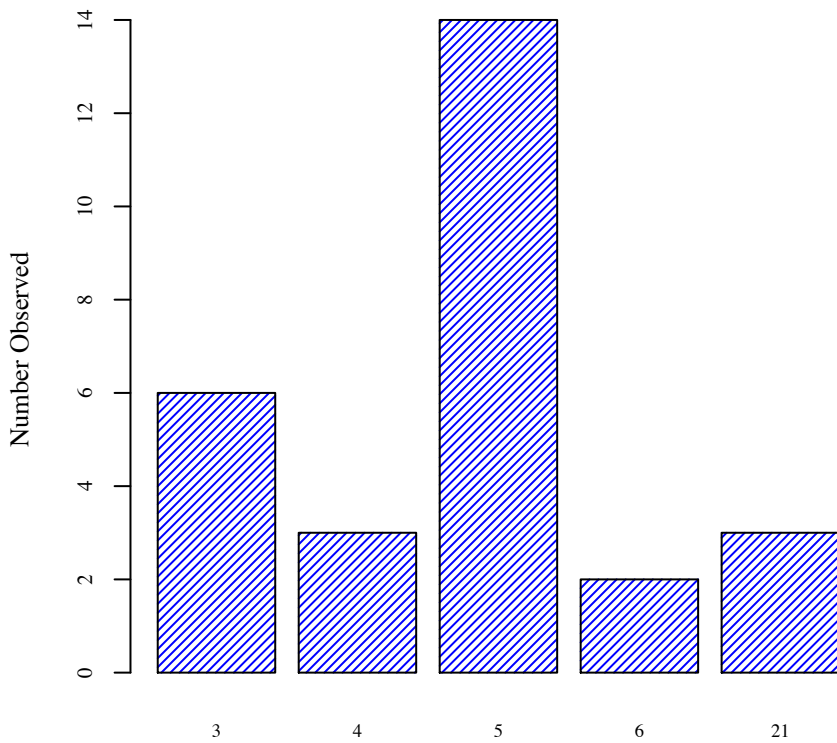


Figure 81 . Regression model, location, and depth information for shark, bonnethead (*Sphyrna tiburo*).

Shark, Bigeye Sixgill

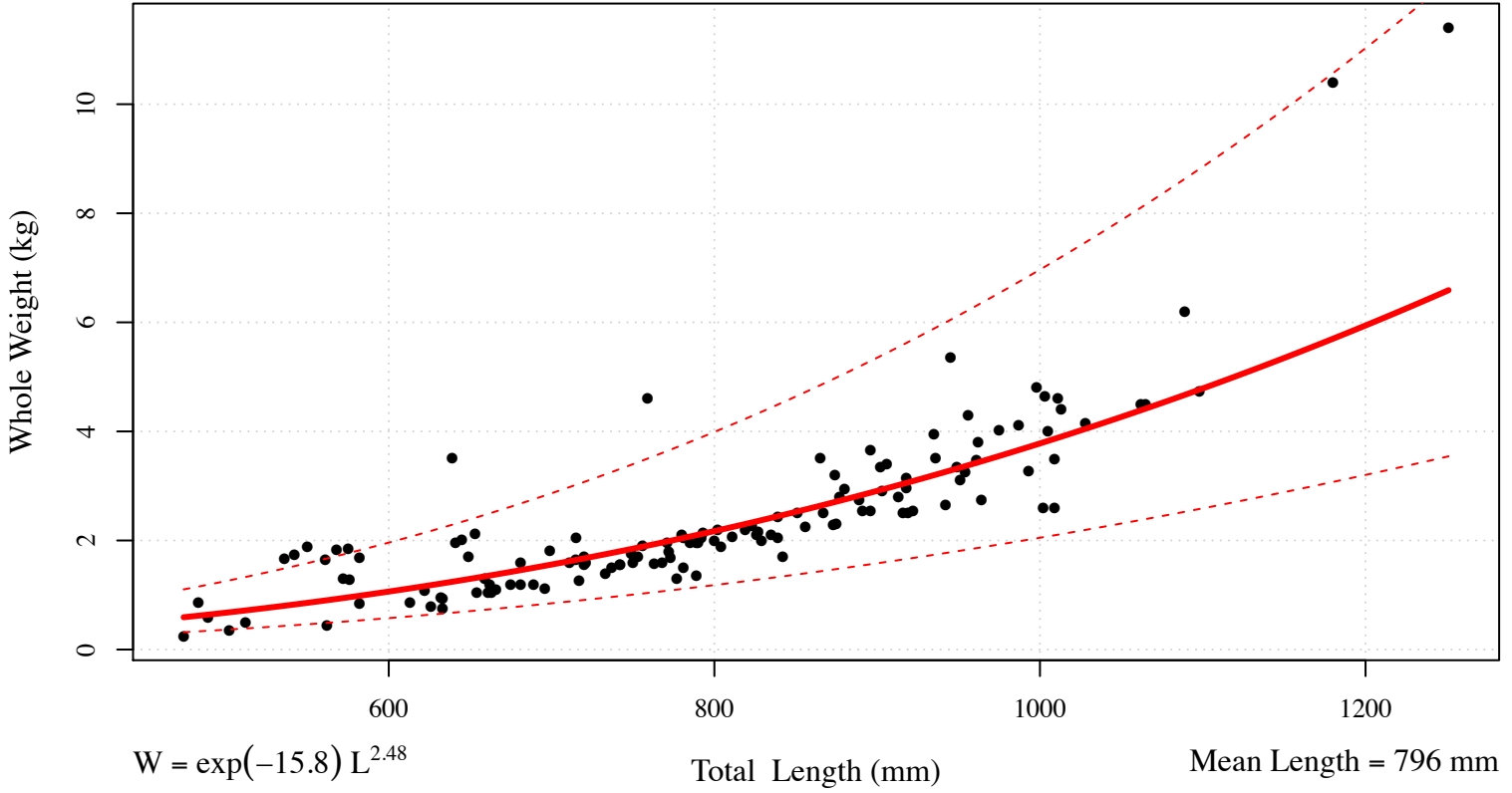
Hexanchus vitulus

$R^2 = 0.73$

N = 134

RSE = 0.306

Most common fate is discarded alive



More common in the Eastern Gulf

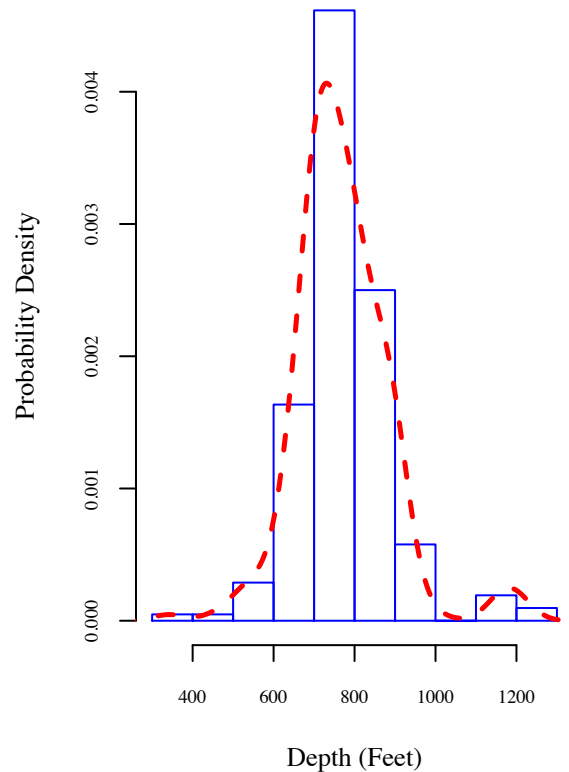
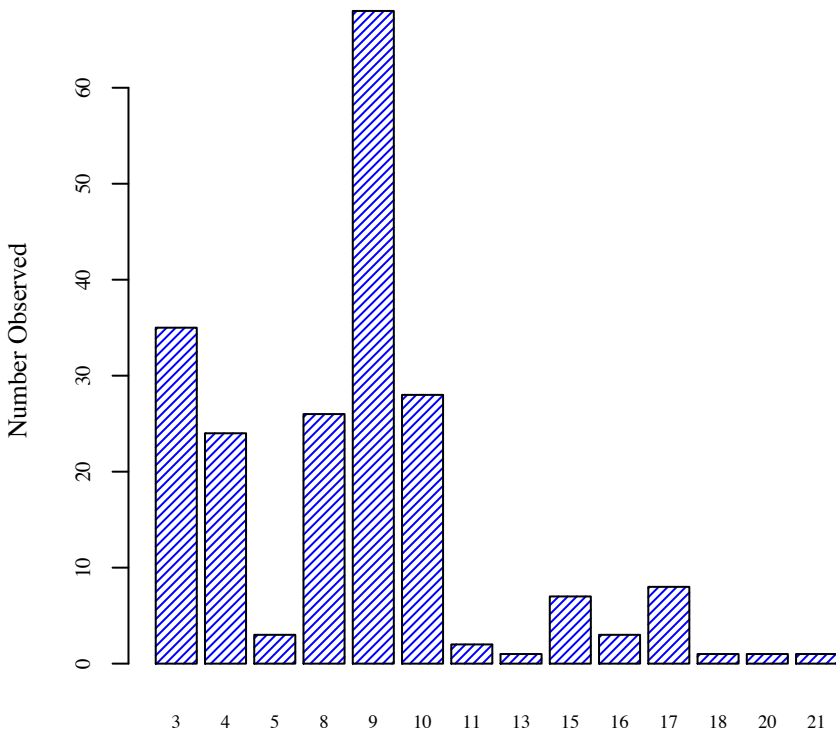


Figure 82 . Regression model, location, and depth information for shark, bigeye sixgill (*Hexanchus vitulus*).

Shark, Sevengill

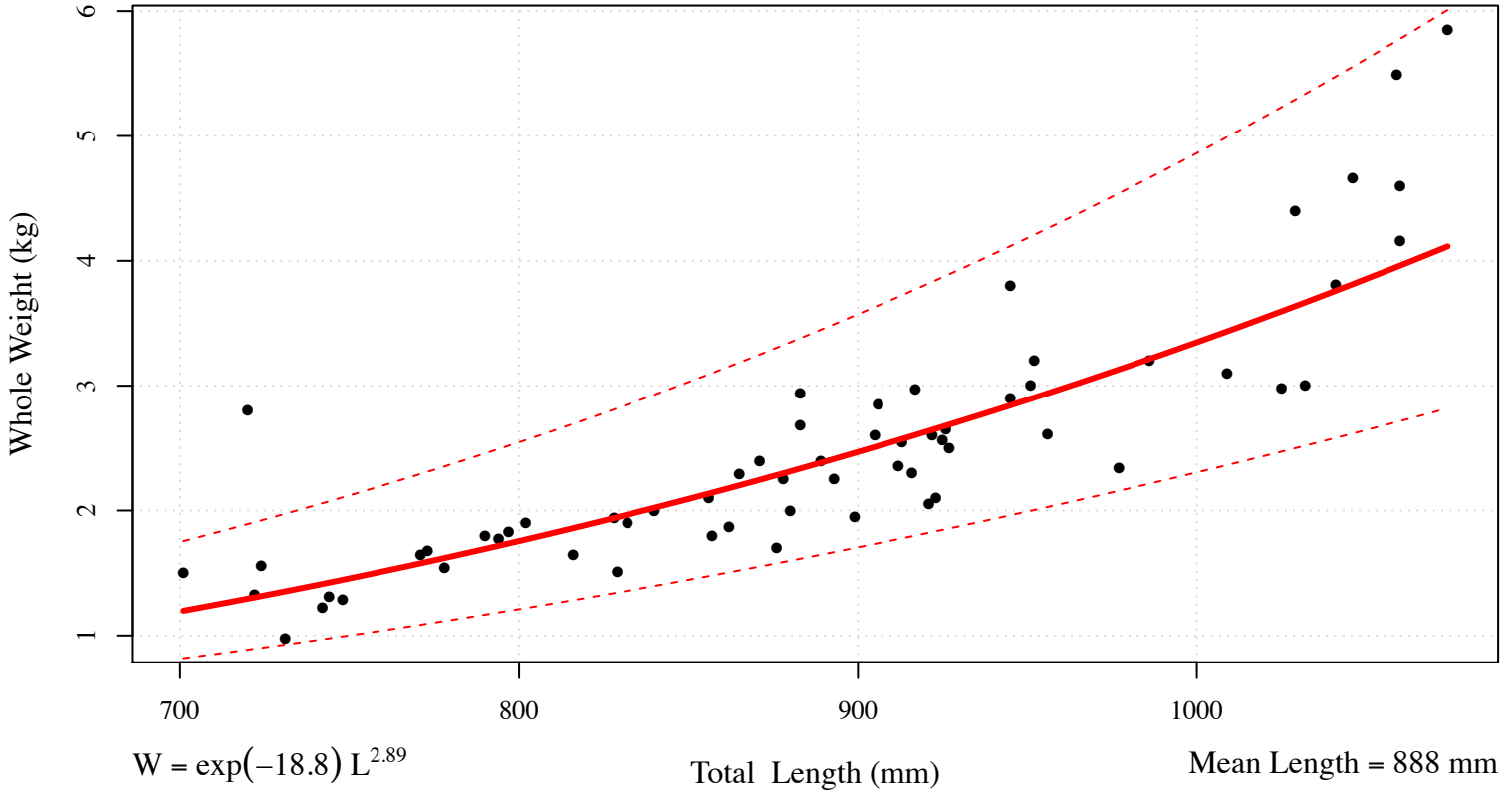
Hepranchias perlo

$R^2 = 0.757$

N = 62

RSE = 0.183

Most common fate is discarded alive



More common in the Western Gulf

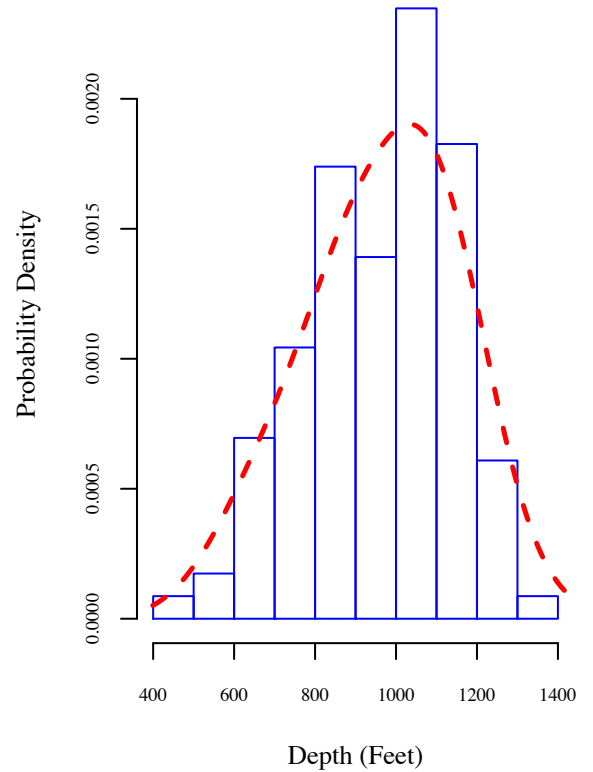
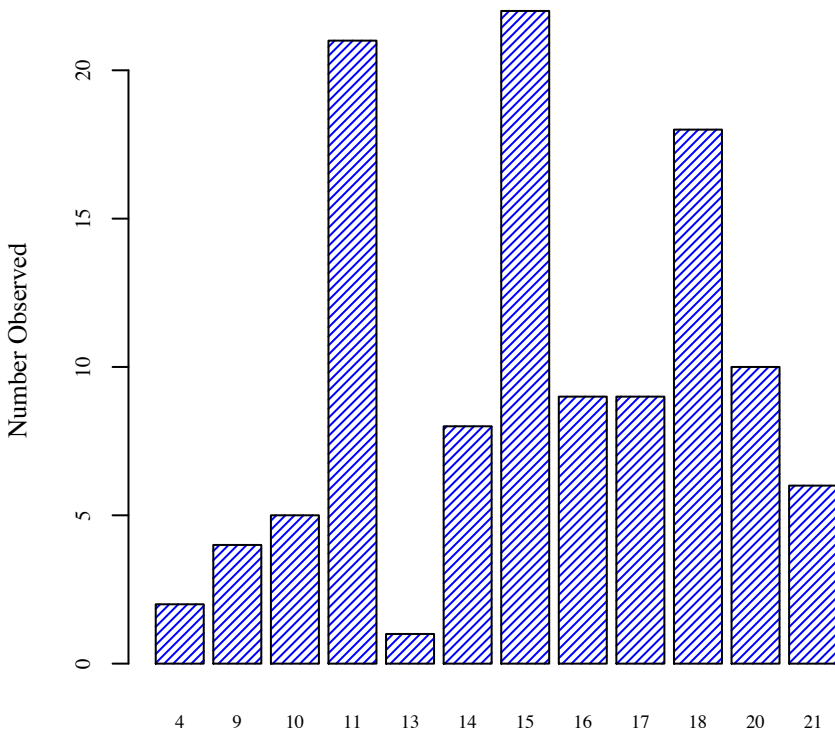


Figure 83 . Regression model, location, and depth information for shark, sevengill (*Hepranchias perlo*).

Dogfish, Chain

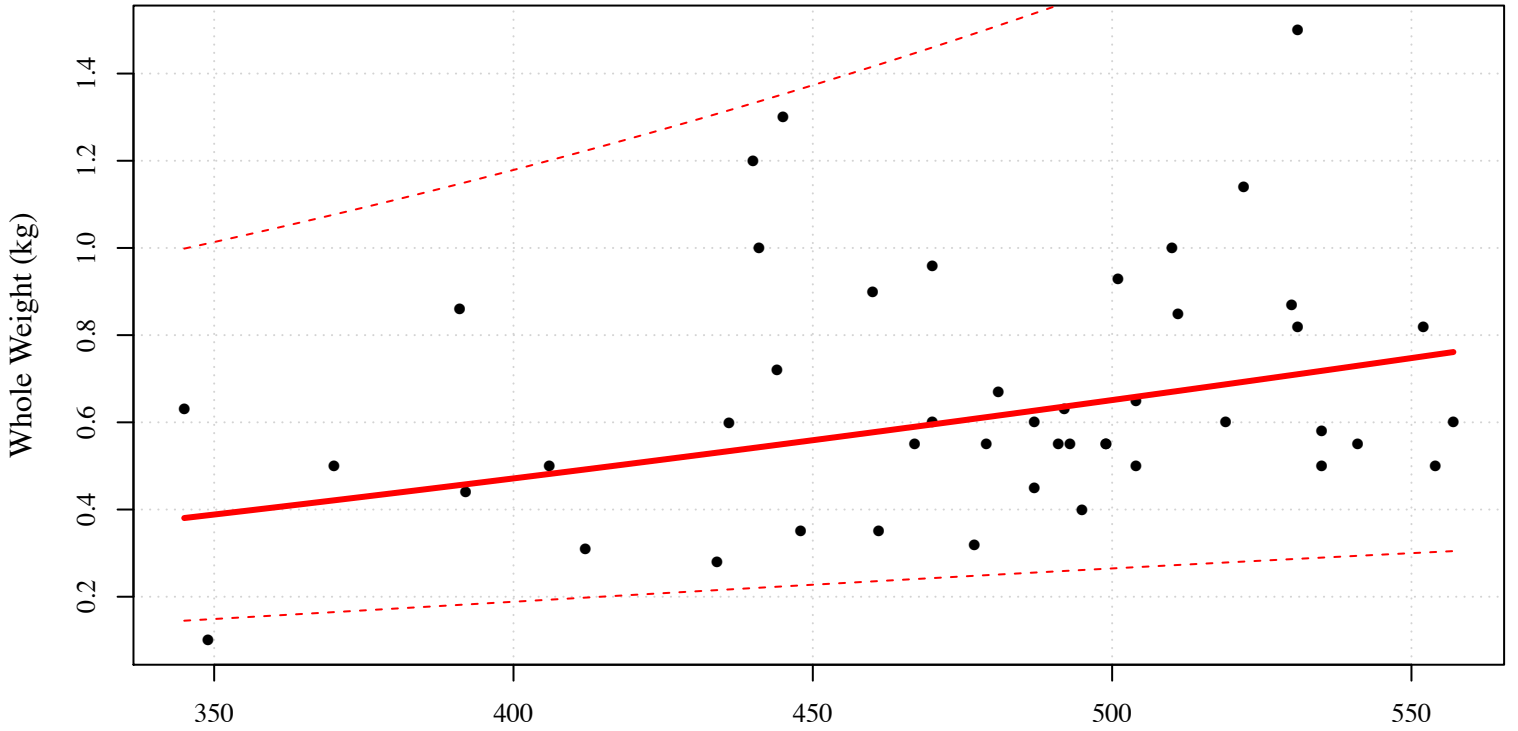
Scyliorhinus retifer

$R^2 = 0.113$

N = 46

RSE = 0.44

Most common fate is discarded alive



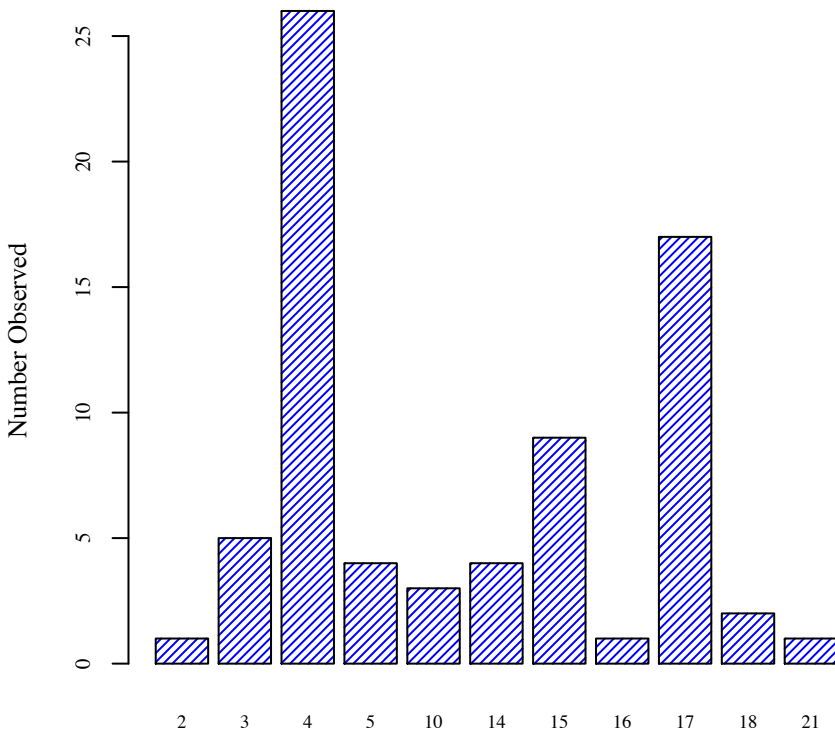
$$W = \exp(-9.43) L^{1.45}$$

Total Length (mm)

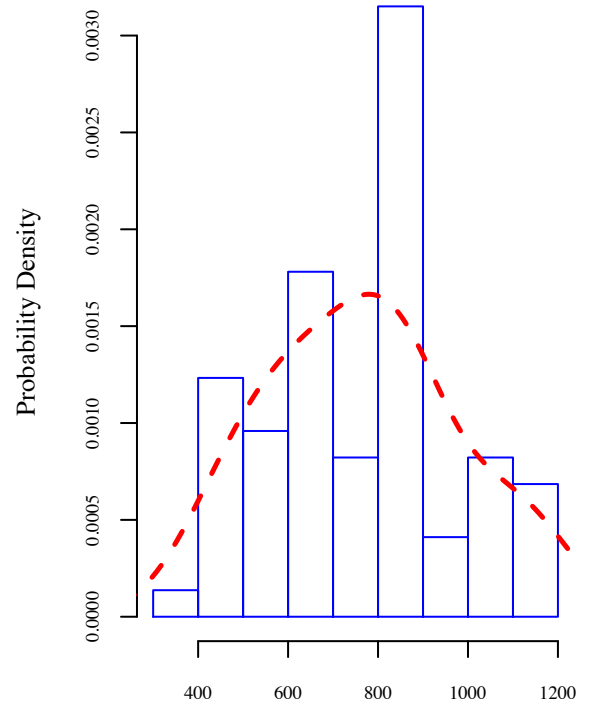
Mean Length = 476 mm

Mean Weight = 0.66 kg

More common in the Eastern Gulf



Statistical Zones, N = 73



Depth (Feet)

Figure 84 . Regression model, location, and depth information for dogfish, chain (*Scyliorhinus retifer*).

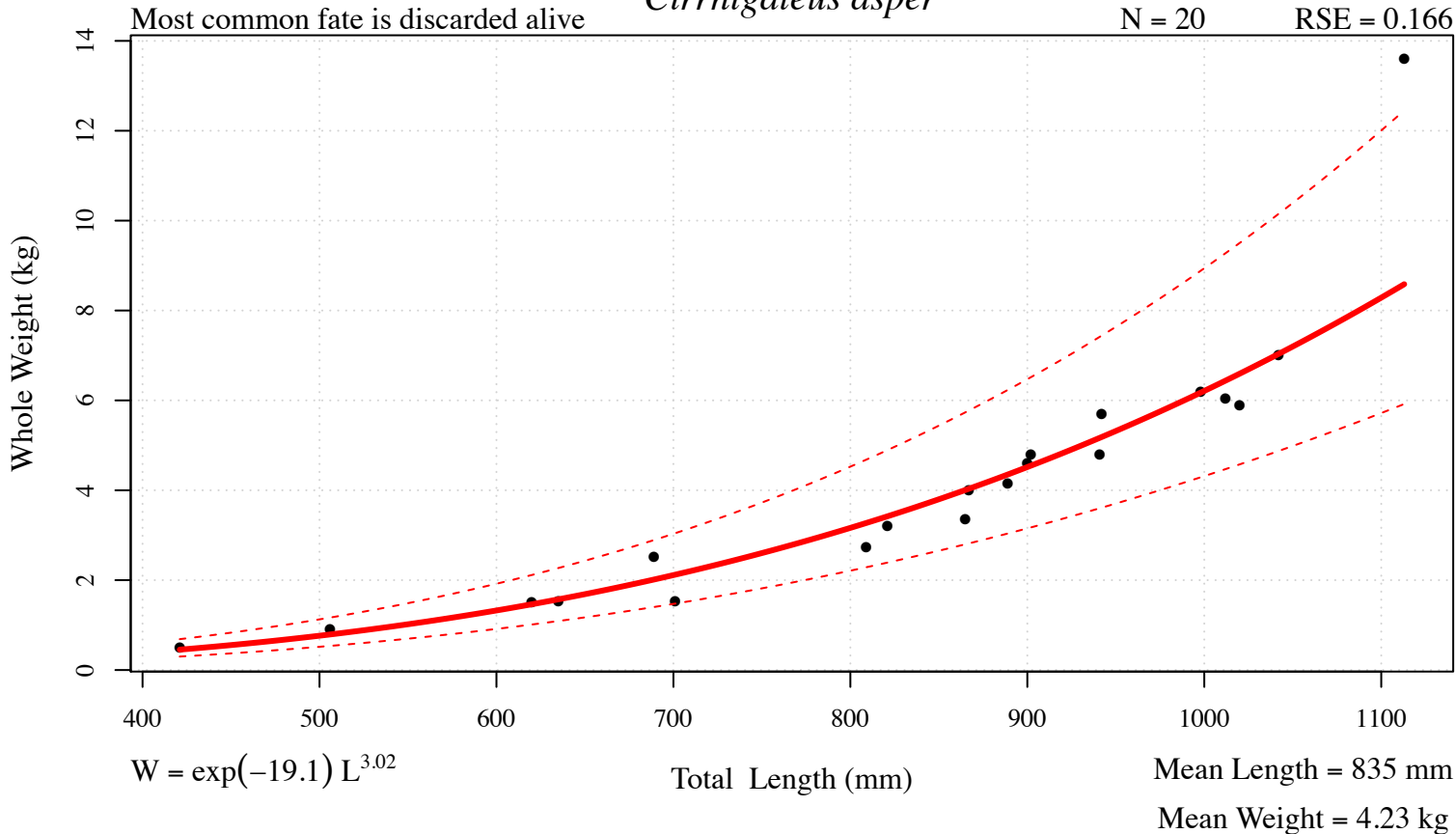
Dogfish, Roughskin

Cirrhigaleus asper

$R^2 = 0.955$

N = 20

RSE = 0.166



More common in the Eastern Gulf

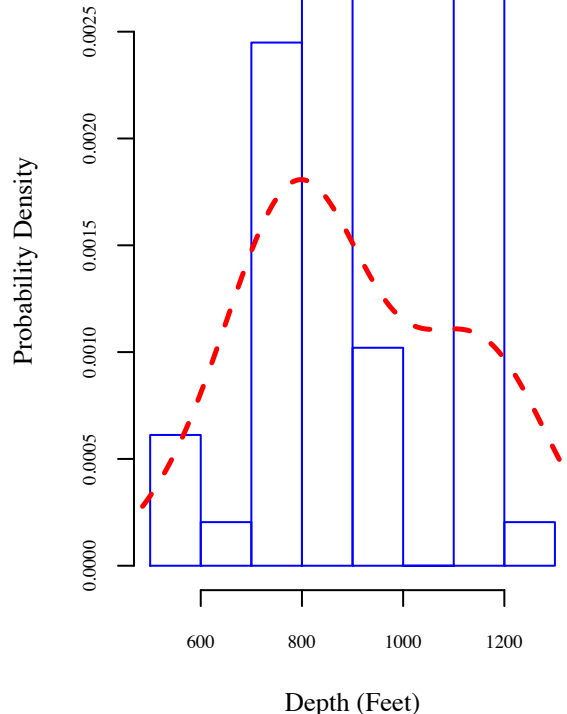
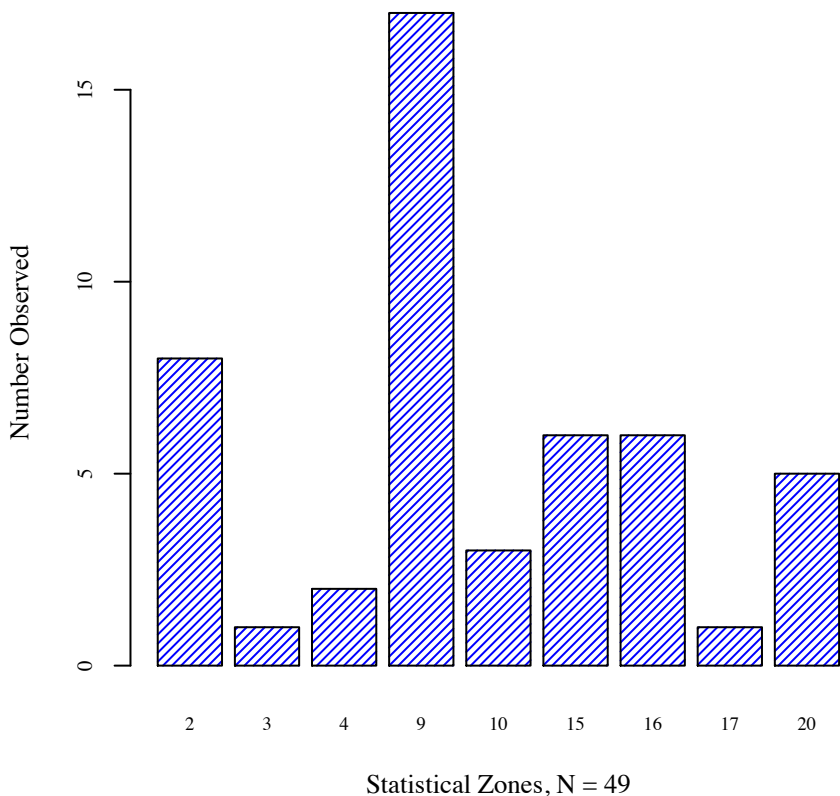
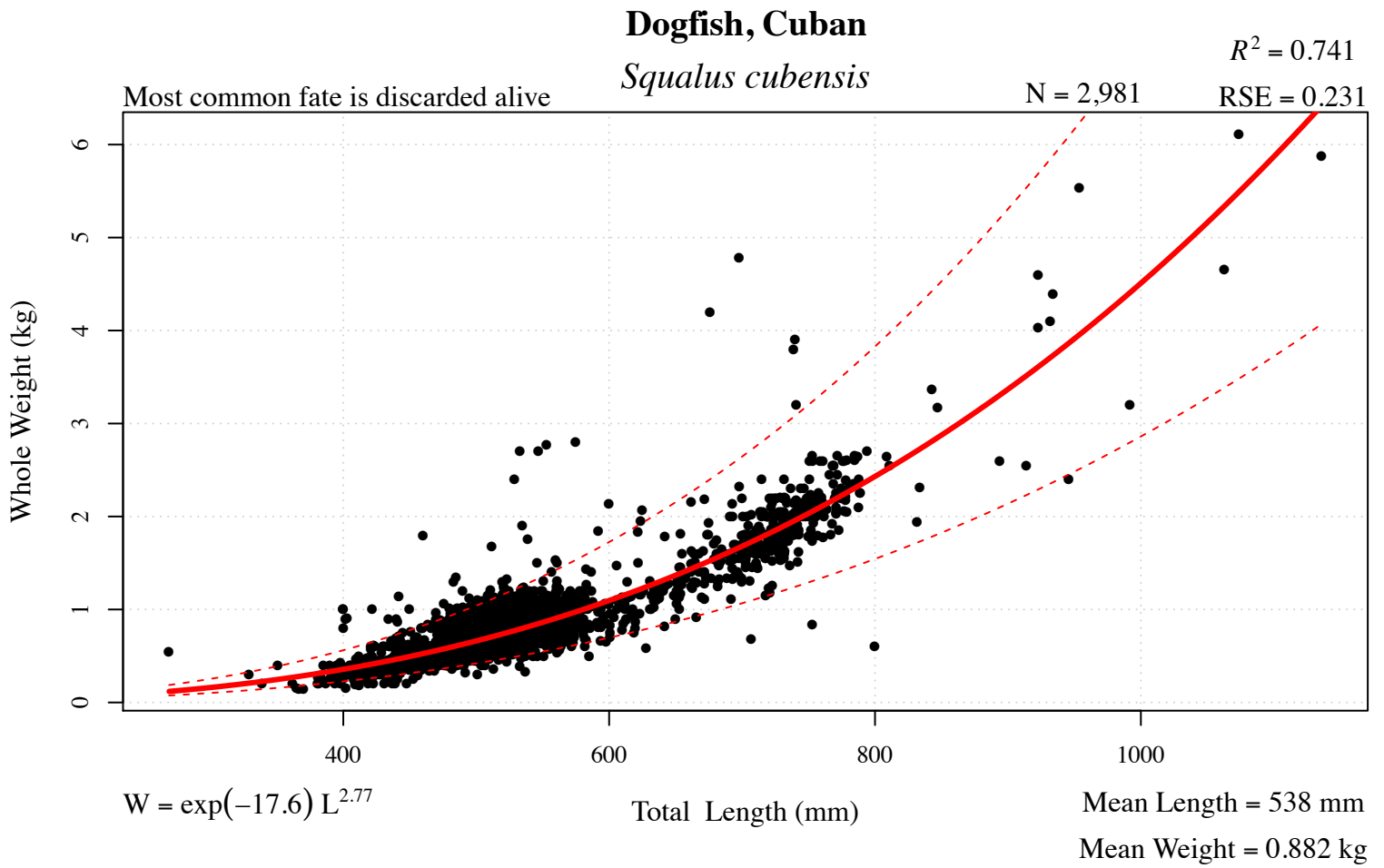


Figure 85 . Regression model, location, and depth information for dogfish, roughskin (*Cirrhigaleus asper*).



More common in the Eastern Gulf

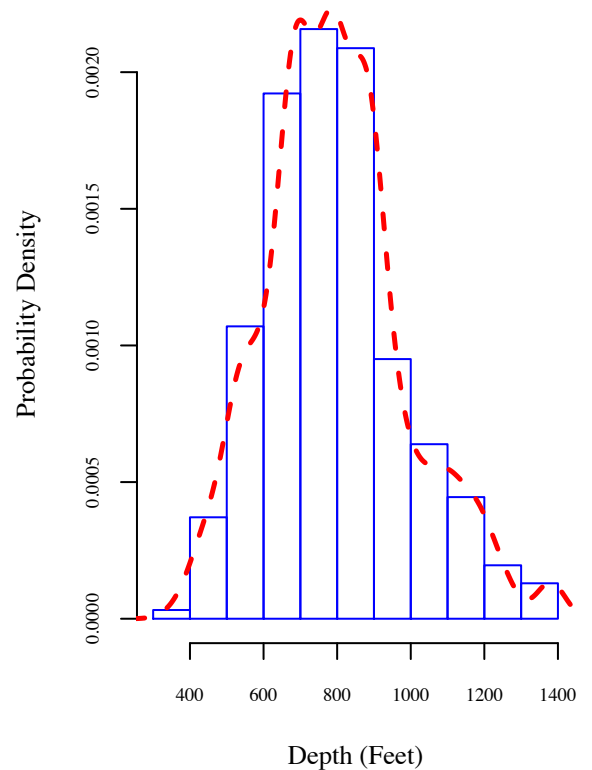
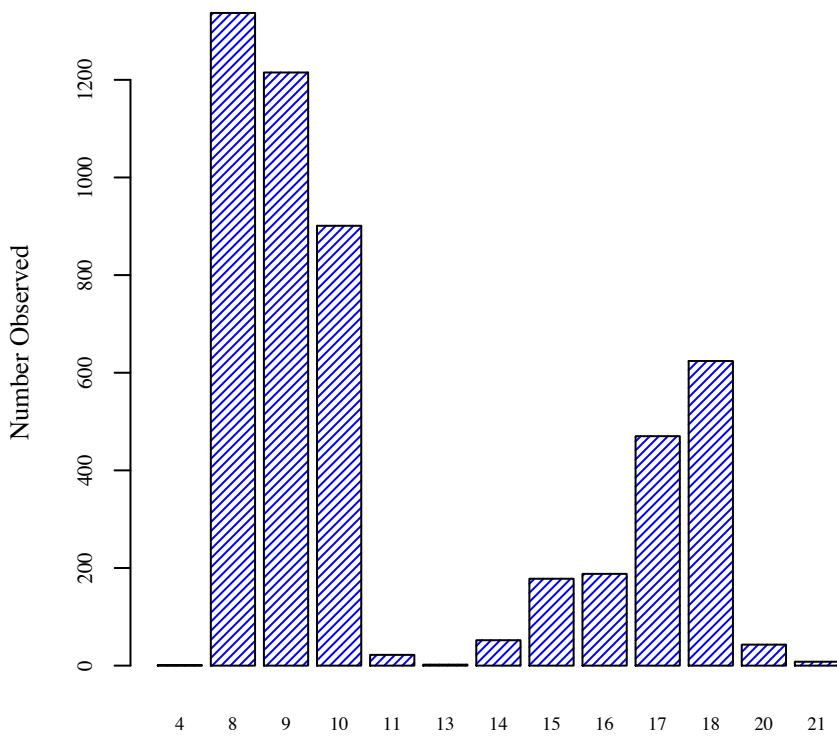


Figure 86 . Regression model, location, and depth information for dogfish, cuban (*Squalus cubensis*).

Dogfish, Shortspine

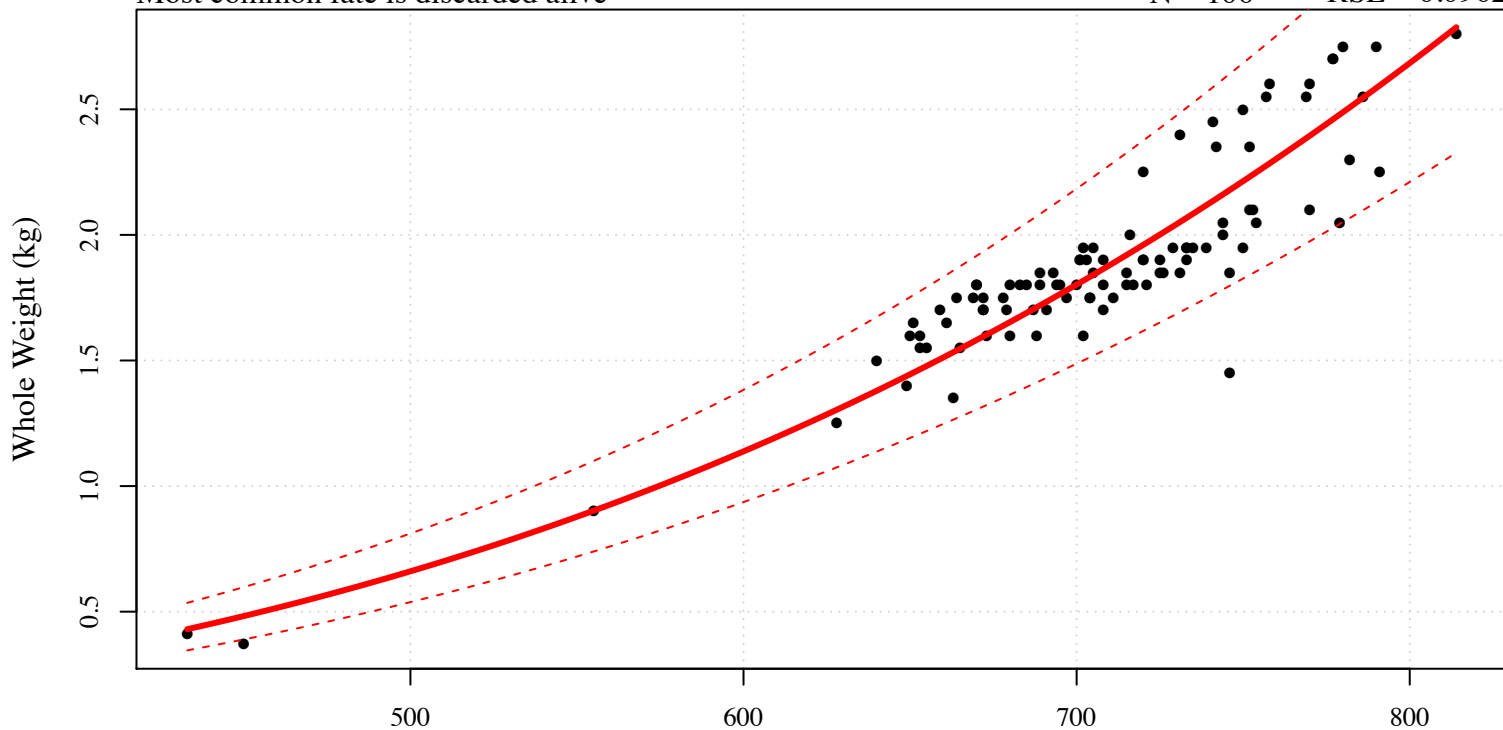
Squalus mitsukurii

$R^2 = 0.889$

N = 106

RSE = 0.0962

Most common fate is discarded alive



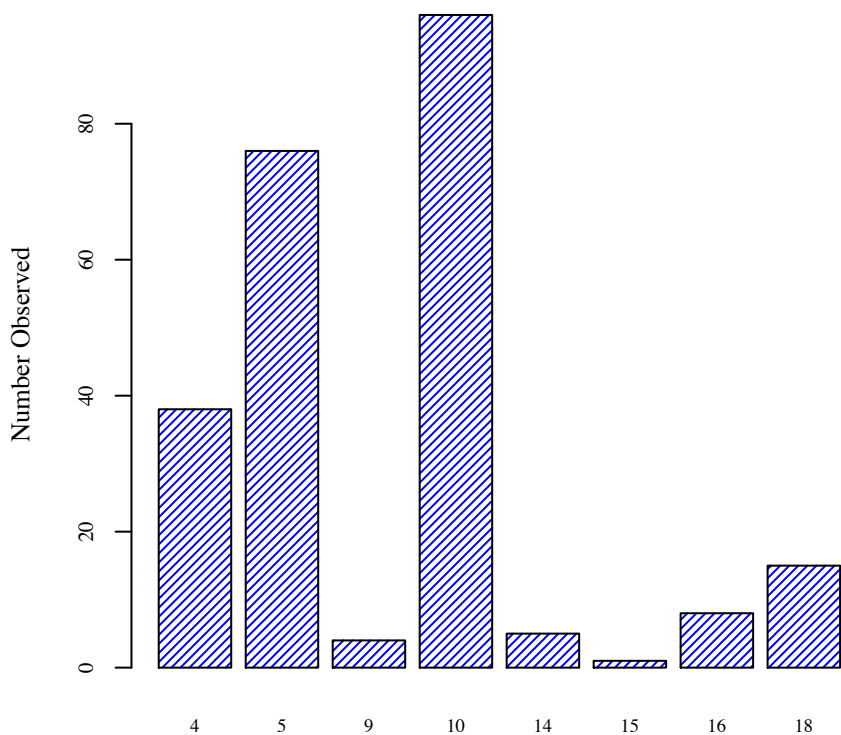
$$W = \exp(-18.9) L^{2.98}$$

Total Length (mm)

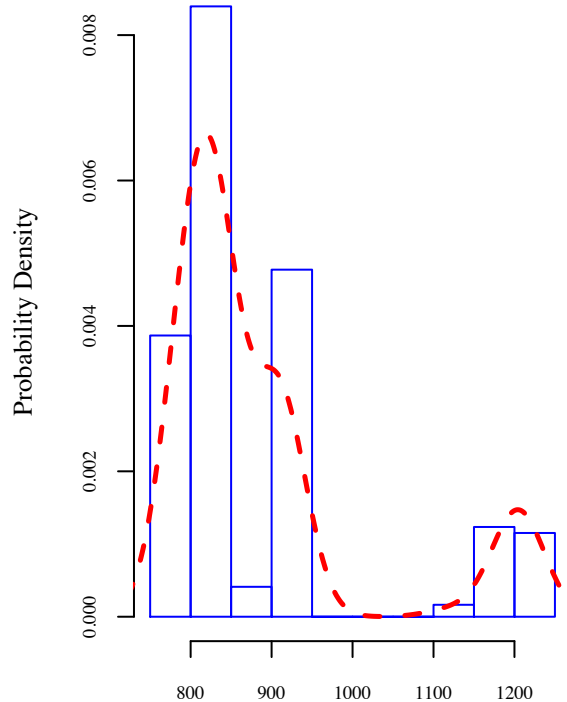
Mean Length = 707 mm

Mean Weight = 1.89 kg

More common in the Eastern Gulf



Statistical Zones, N = 243



Depth (Feet)

Figure 87 . Regression model, location, and depth information for dogfish, shortspine (*Squalus mitsukurii*).

Shark, Smooth Dogfish

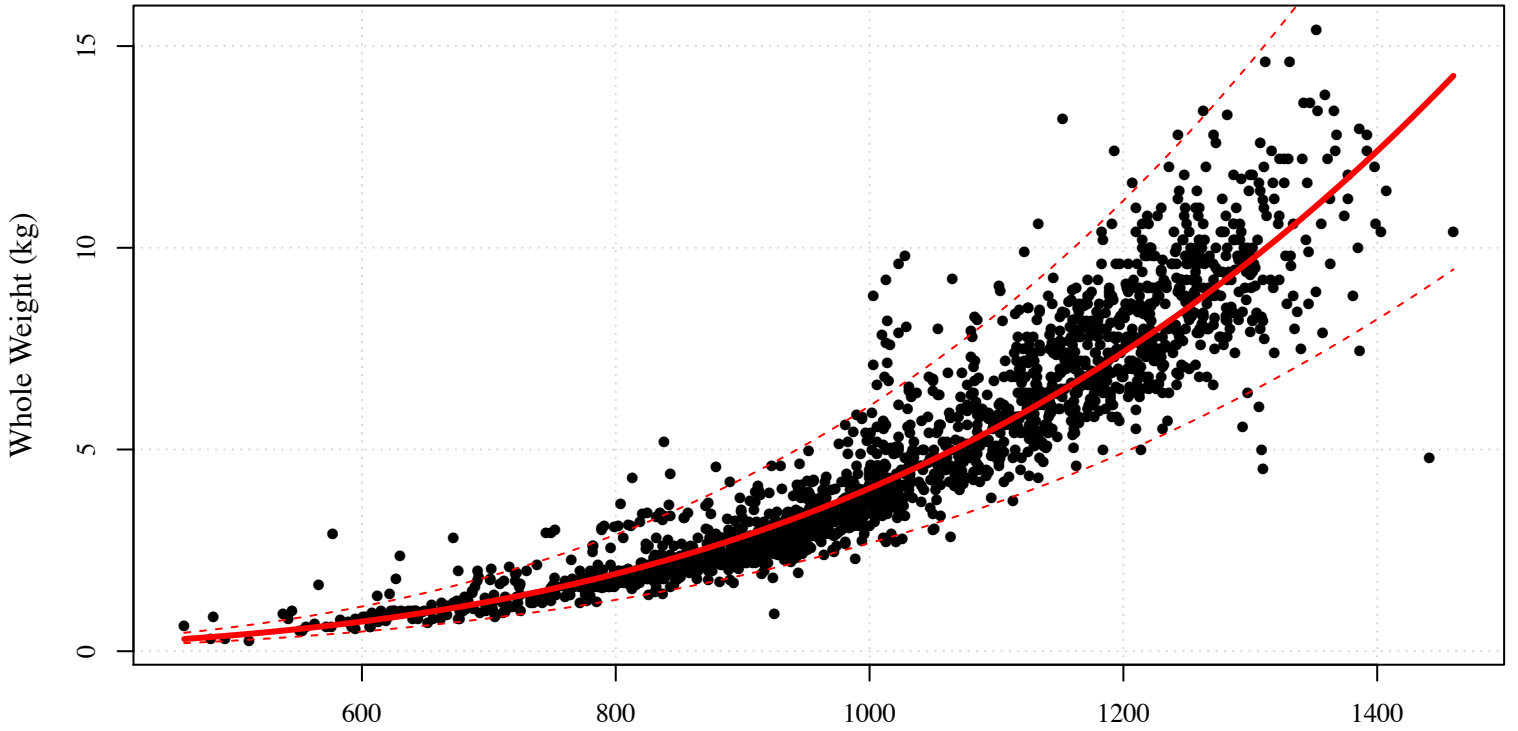
Mustelus canis

$R^2 = 0.902$

N = 1,929

RSE = 0.209

Most common fate is discarded alive



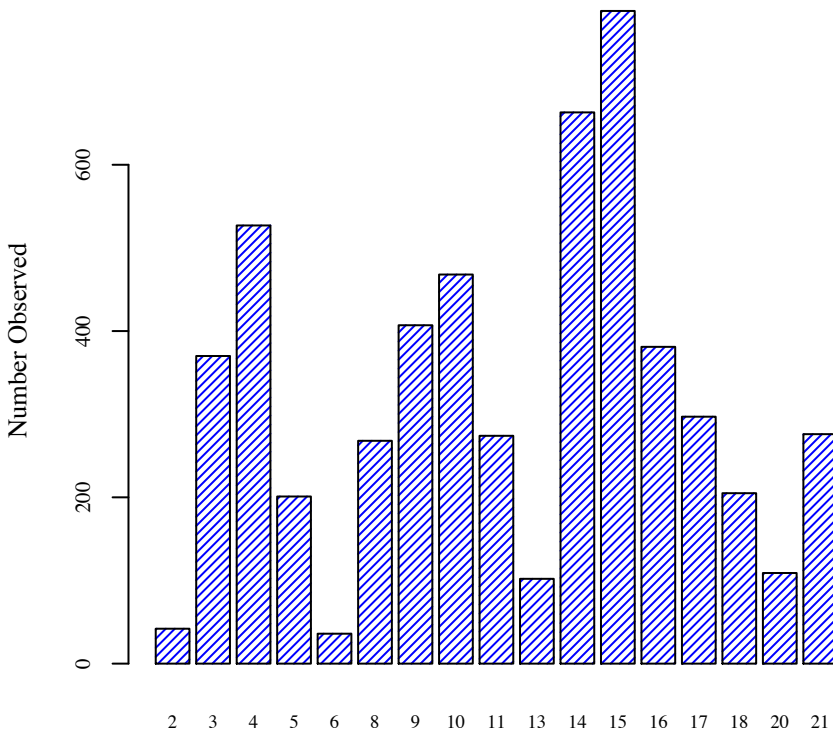
$$W = \exp(-21.6) L^{3.33}$$

Total Length (mm)

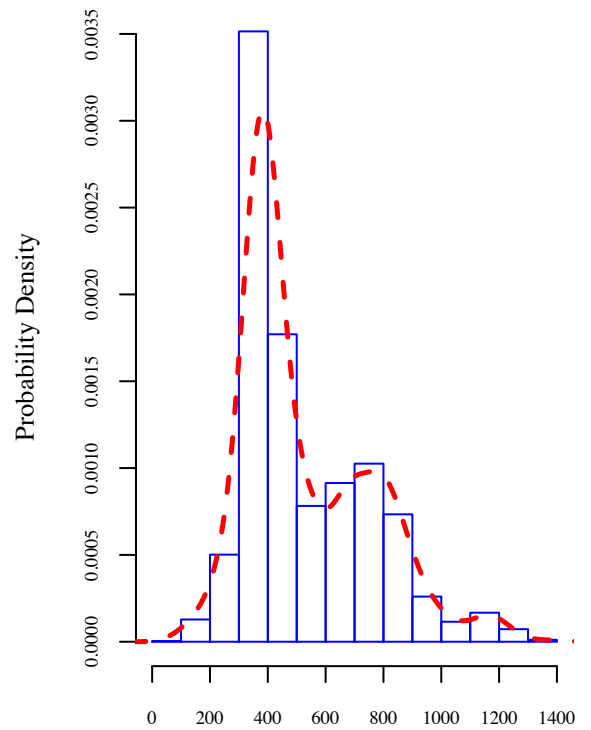
Mean Length = 1023 mm

Mean Weight = 5.01 kg

More common in the Western Gulf



Statistical Zones, N = 5,411



Depth (Feet)

Figure 88 . Regression model, location, and depth information for shark, smooth dogfish (*Mustelus canis*).

Shark, Atlantic Sharpnose

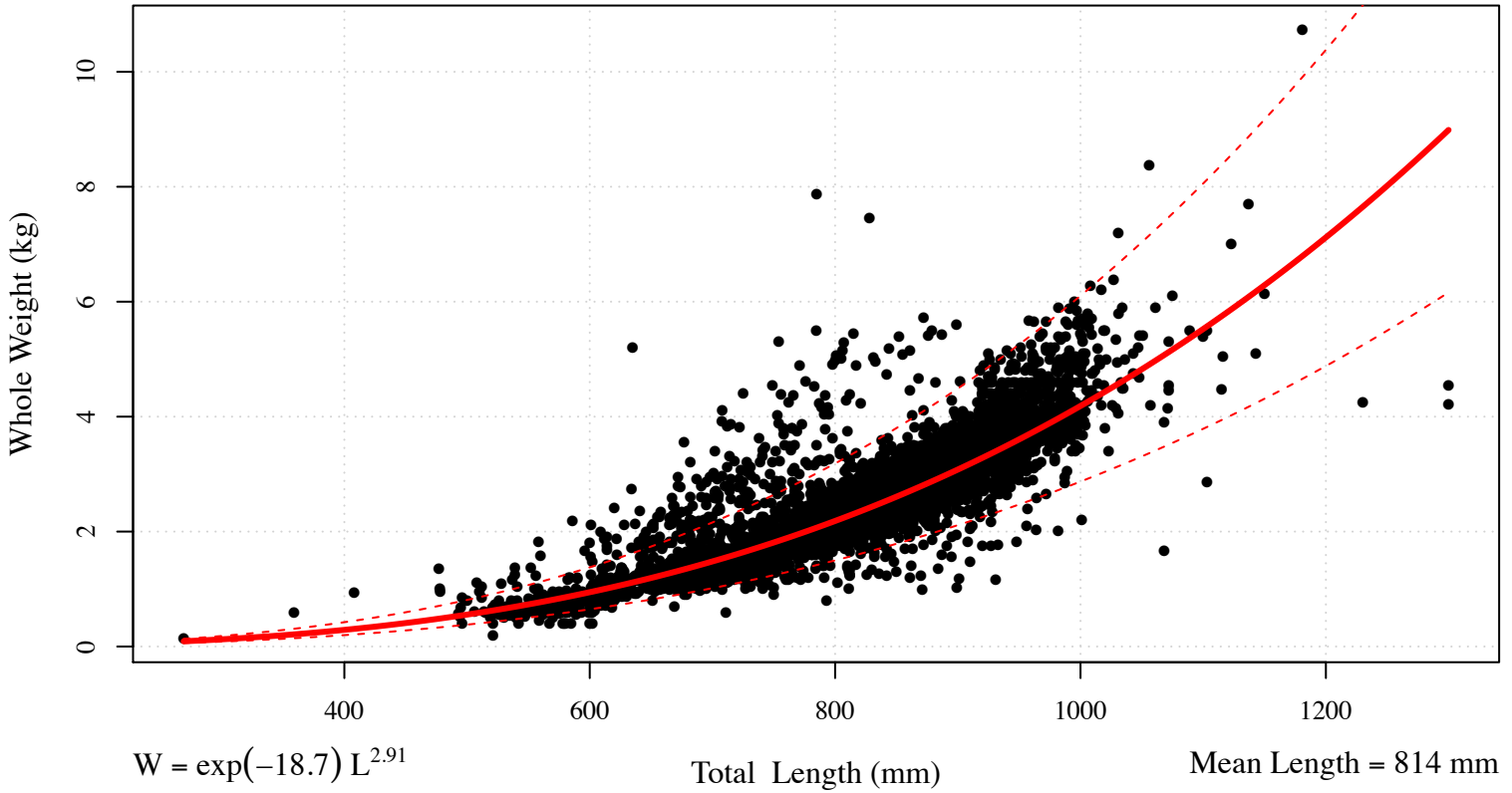
Rhizoprionodon terraenovae

$R^2 = 0.792$

N = 6,540

RSE = 0.192

Most common fate is discarded alive



More common in the Eastern Gulf

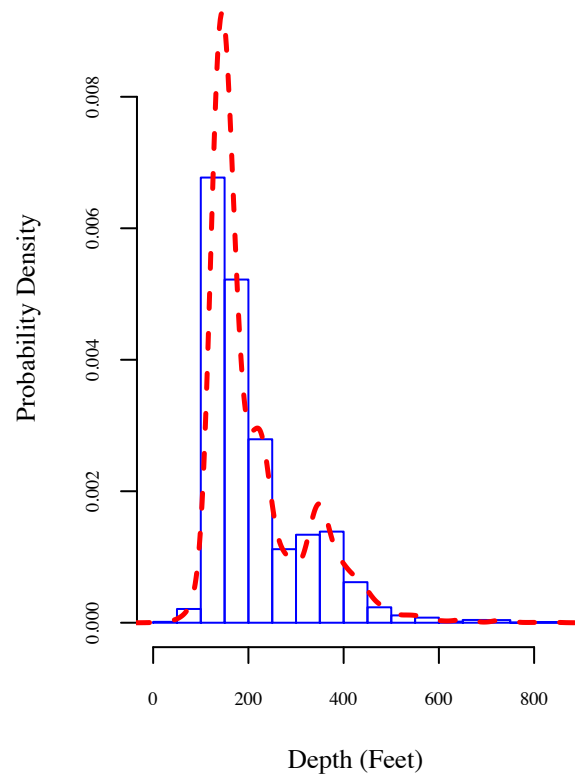
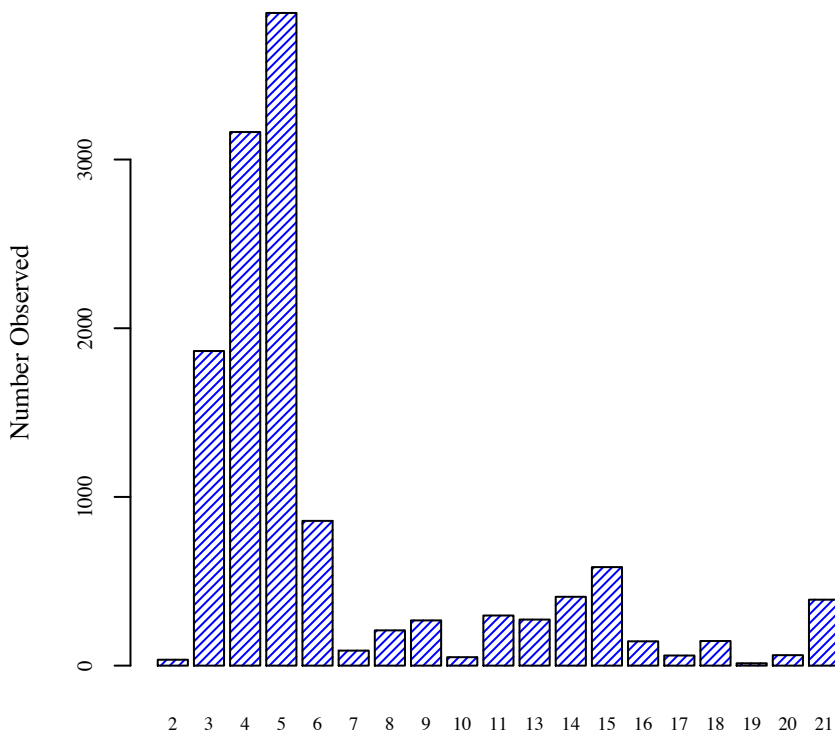
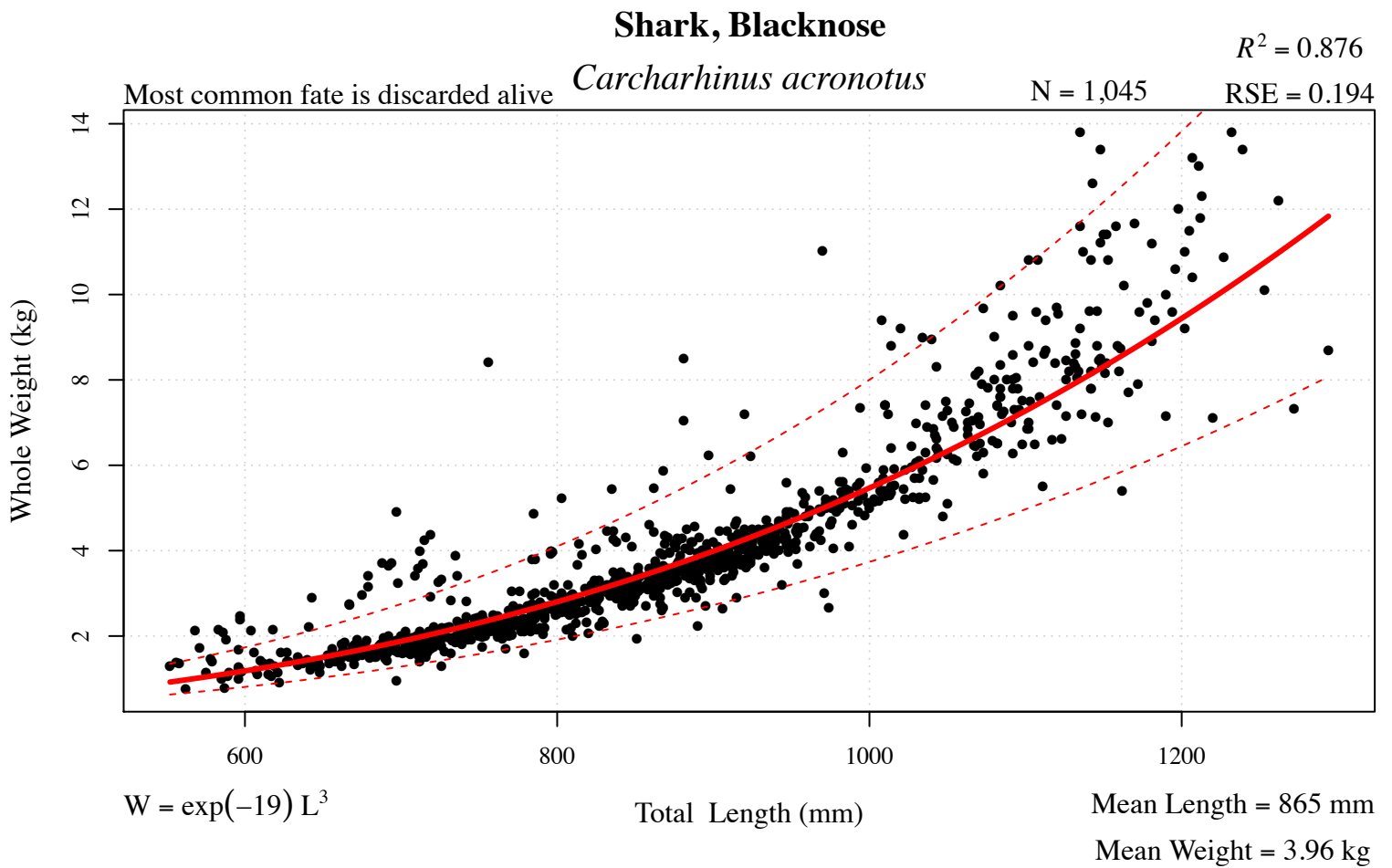


Figure 89 . Regression model, location, and depth information for shark, atlantic sharpnose (*Rhizoprionodon terraenovae*).



More common in the Eastern Gulf

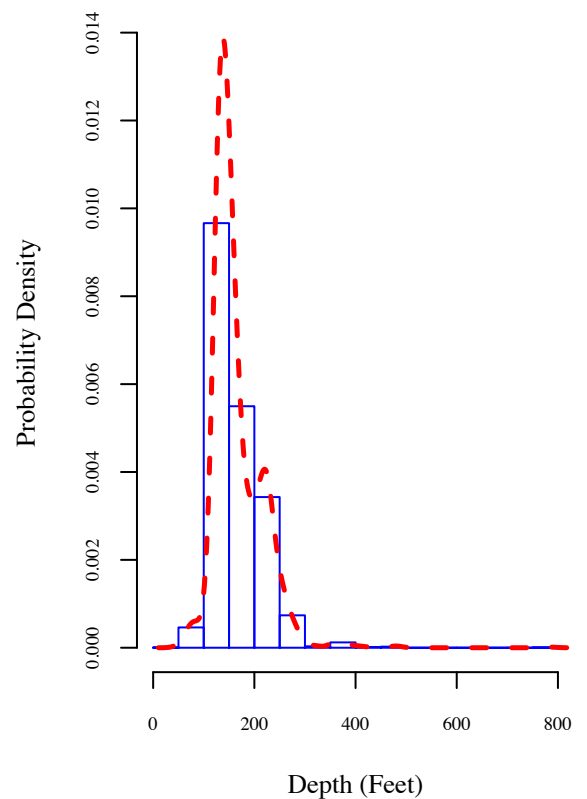
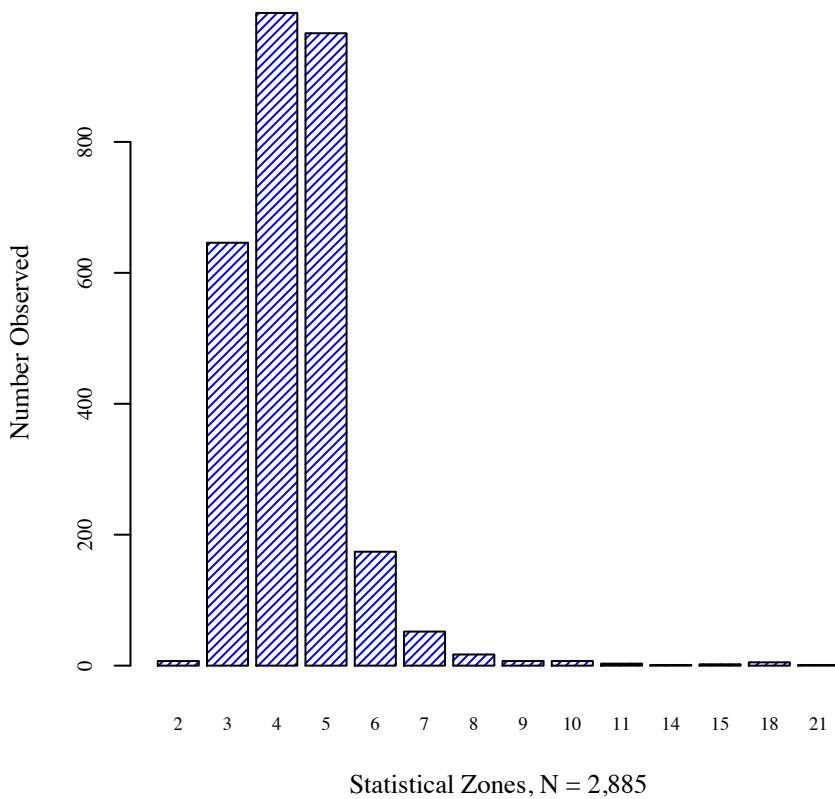


Figure 90 . Regression model, location, and depth information for shark, blacknose (*Carcharhinus acronotus*).

Shark, Finetooth

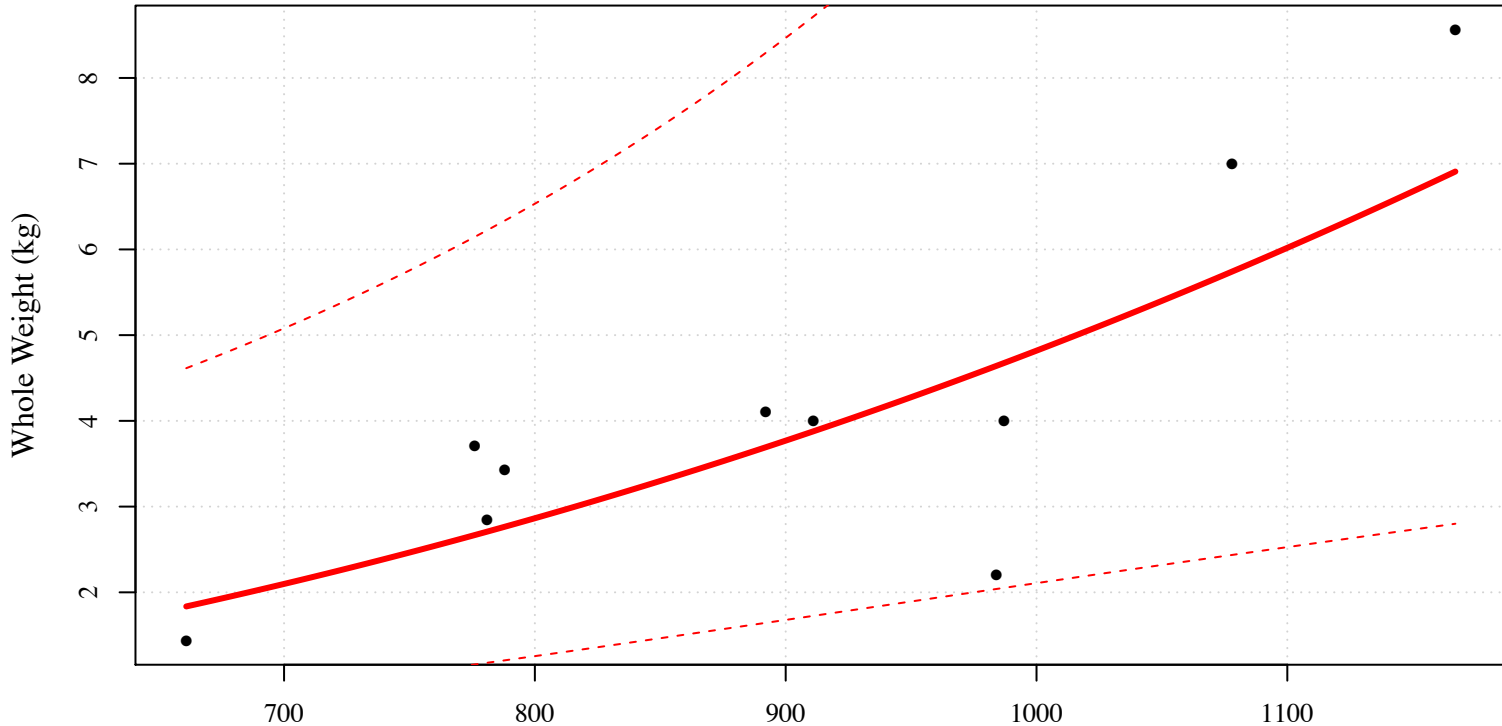
Carcharhinus isodon

$R^2 = 0.574$

N = 10

RSE = 0.335

Most common fate is discarded alive



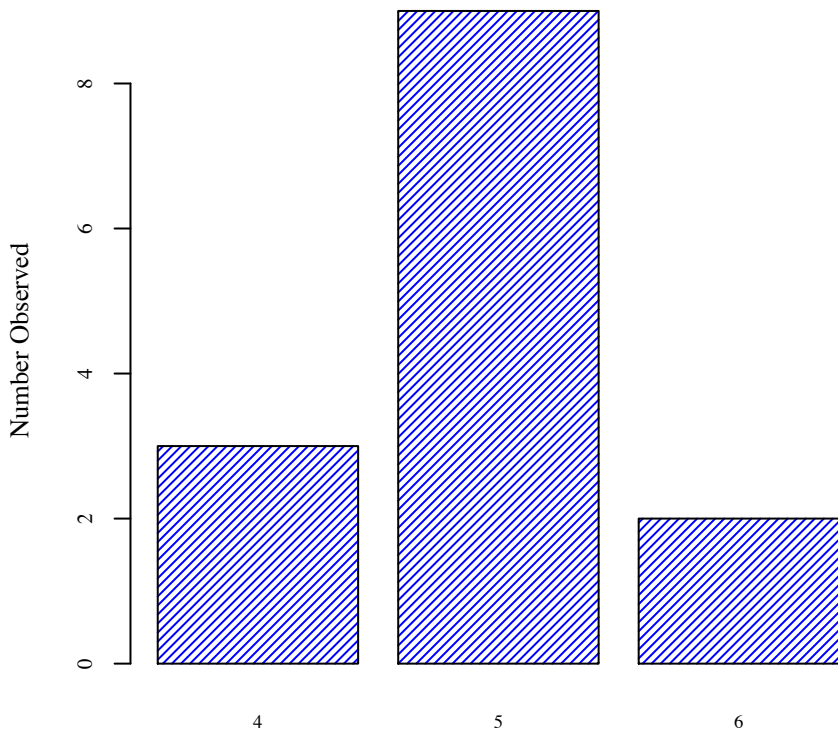
$W = \exp(-14.5) L^{2.33}$

Total Length (mm)

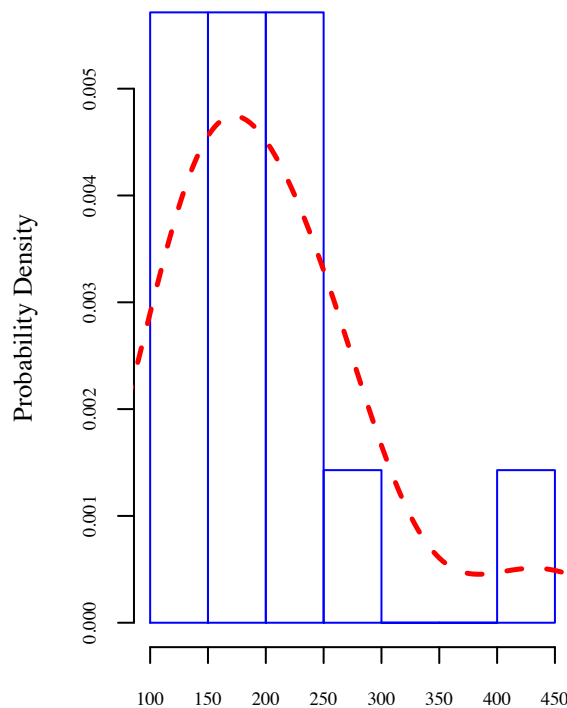
Mean Length = 902 mm

Mean Weight = 4.13 kg

More common in the Eastern Gulf



Statistical Zones, N = 14



Depth (Feet)

Figure 91 . Regression model, location, and depth information for shark, finetooth (*Carcharhinus isodon*).

Shark, Silky

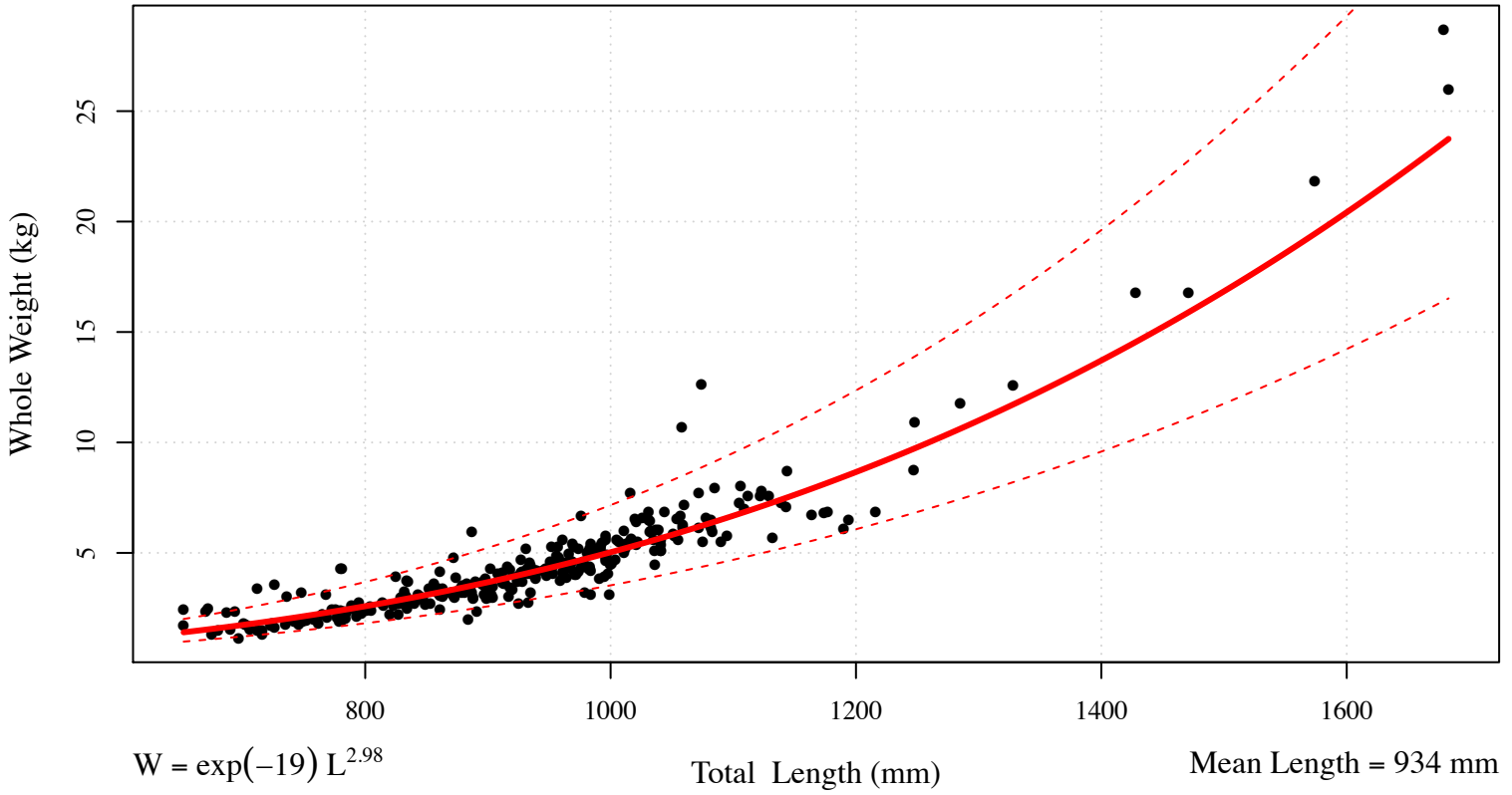
Carcharhinus falciformis

$R^2 = 0.862$

N = 311

RSE = 0.179

Most common fate is discarded alive



Mean Length = 934 mm

Mean Weight = 4.52 kg

More common in the Eastern Gulf

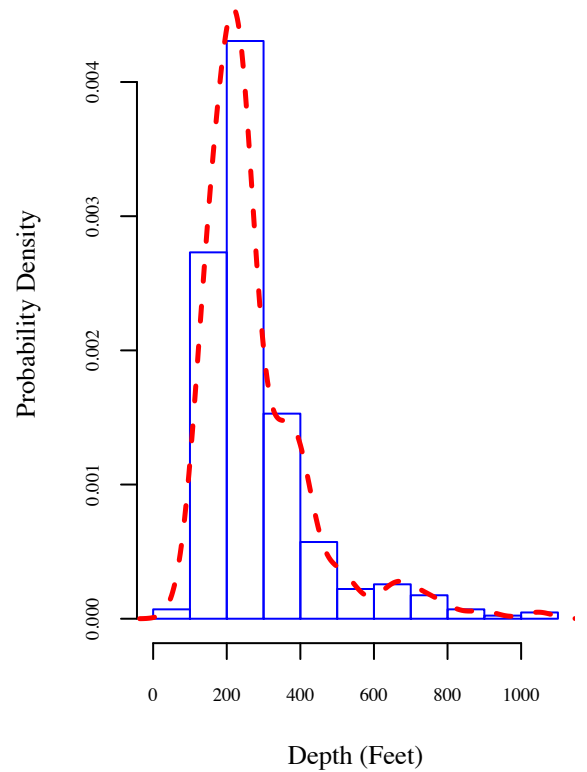
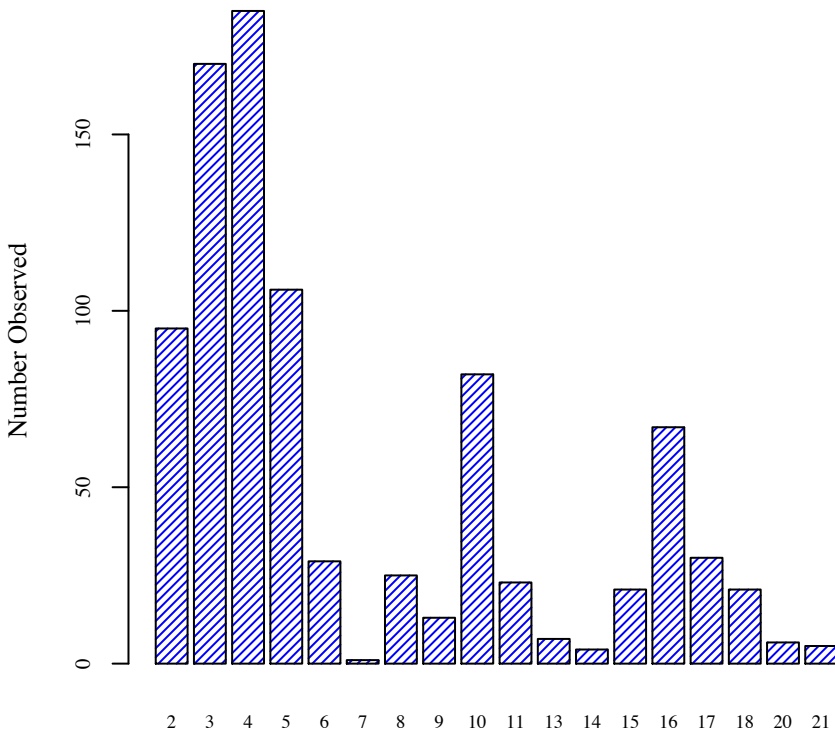


Figure 92 . Regression model, location, and depth information for shark, silky (*Carcharhinus falciformis*).