

Offshore Index Assessment Program

2004 Summary Report

Upper Great Lakes Management Unit
Lake Huron
Report: PS-LHA-IA04-SUM



Ministry of
Natural Resources
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Richesses naturelles

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Introduction

The Lake Huron office of the Upper Great Lakes Management Unit (UGLMU) conducts annual index gill net surveys throughout the Canadian waters of the main basin of Lake Huron, Georgian Bay and the North Channel. The program is known as the Offshore Index Assessment Program (OSIA). The purpose of the assessment is to monitor the populations of commercially exploited species while simultaneously collecting information on the offshore fish community of Lake Huron. For the commercially important species, one of the primary uses of the index program is to characterize the strength of year classes before they recruit into the fishery. Additionally, the OSIA program is an important tool in quantifying progress towards bi-national efforts to restore lake trout (*Salvelinus namaycush*), assess sea lamprey impacts, and construct predator-prey models populations throughout the lake make the OSIA program an important tool in quantifying progress towards that goal.

Briefly, the OSIA program consists of overnight bottom sets of standardized monofilament gill net gear set at various locations throughout Lake Huron ([Figure 1](#)). Logistical and financial constraints have caused minor modifications in sampling protocol since the program's inception, but for the most part, the program has remained unchanged. As a result, the OSIA program provides an invaluable, long-term trend-through-time record of the offshore fish community of Lake Huron.

This report provides a summary of the individual 2004 OSIA projects including materials and methods, net set locations, depths and durations, and species composition of the catch. It also provides details of any changes to the sampling process that may have deviated from the long term protocol. For selected species, a more thorough examination including catch per unit of effort (CPUE), length-at-age, and pre-recruit index calculations is also provided. Finally, this report will present a brief discussion of how the results of the 2004 field season differ from past years.

Materials and Methods

The OSIA program employs graded mesh monofilament gillnets. The nets used in virtually all programs in 2004 by the UGLMU consisted of a 15 m panel of 32 mm (1.25" stretch measure) mesh, and a 25 m panel of 38 mm (1.5") mesh followed by 50 m panels of 51 mm (2.0"), 64 mm (2.5"), 76 mm (3.0"), 89 mm (3.5"), 102 mm (4.0"), 114 mm (4.5") and 127 mm (5.0") mesh. This gear configuration is identified as GL32 and the only difference from the long-term standard index gear is the addition of the 32 mm mesh panel. The assembly of individual panels

that make up a standard index net are often referred to as a net “gang”. In 2004, one alternative gear configurations was deployed as a deepwater chub (*Coregonus hoyi*) specific net gang that consisted of 100 m panels of 38, 51, 64 and 76 mm monofilament mesh. This net configuration was identified by the gear code GL19 and was only deployed in the western Georgian Bay OSIA program.

Another change to the OSIA program that was continued in 2004, was the addition of a third net set each day. This departs from historical OSIA protocol where two nets were deployed, parallel to one another, 400 to 600 m apart at roughly pre-determined locations. While this part of the protocol remained unchanged, a third net was added to increase both the number of net sets, and increase the spatial coverage of the program.

Regardless of gear configuration, nets were normally set perpendicular to the depth contours. The orientation of nets set in southern Georgian Bay off of Cape Rich alternated daily from perpendicular to parallel to depth contours, while in the North Channel, nets were always set parallel to depth contours. For the paired nets, mesh orientation was alternated, while the mesh orientation of the third net set each day was randomly determined.

Additionally, in 2004, Stow-away Tidbit temperature loggers were deployed with each net to record water temperature over the duration of the set. One temperature logger was fixed to the floating line on each end of each net to verify that the nets remained in the targeted water temperature.

All OSIA projects were conducted from the Ontario Ministry of Natural Resources’ research vessel the *Wonda Goldie*. At each net set location, Secchi depth, latitude and longitude were recorded, along with the water depth as each mesh size was deployed. Surface water temperatures and water temperature at set depth were noted as well as current weather conditions. The duration of most sets was 20 to 24 hours, although inclement weather and unsafe working conditions occasionally extended net set time. These instances were noted and accounted for in calculations of relative abundance which used effective net nights (ENN) to compensate for gear saturation associated with prolonged fishing times. When a net fished for more than one night, the number of nights fished was adjusted by a factor of 0.7. Thus a net that fished for two consecutive nights was considered to have fished for 1.4 effective net nights for the purposes of CPUE calculations.

After the nets were lifted, the catch was segregated in tubs according to mesh size to facilitate capture-by-mesh size calculations. Once all of the fish were removed from the net, each tub was systematically processed. Fork length (mm), total length (mm) and round weight (g) were

measured for all fish up to 20 individuals of each species from each mesh size. In instances where more than 20 individuals were captured, a sub-sample of 20 was randomly selected for biological measurements. The next 30 selected had an aging structure collected and were measured for fork length only. Individuals beyond 50 of a given species and mesh size were recorded in the catch count, but were not sampled or measured.

Additional information that was normally collected from each fish included the type and number of lamprey marks following GLFC conventions, the presence of fin clips (salmonids only), and sex and maturity. Aging structures (scales, otoliths, fin rays) were also collected, and depending upon the species and project objective, stomach contents and/or tissue samples may also have been collected. Reduced sampling (i.e. fewer biological measurements – fork length and round weight only) occurred for species such as suckers (*Catostomus* and *Moxostoma* spp.), smelt (*Osmerus mordax*), and alewife (*Alosa pseudoharengus*). Scale samples from alewife and sucker species were collected for archival purposes from a subset of all alewife and suckers measured.

Ages for most species were determined from scale samples collected from individual fish. Lake trout ages were assigned based on either fin clip code or coded wire tag (CWT) number if a CWT was present. No age was assigned to lake trout that did not have a CWT or an unambiguous, year specific fin clip.

For lake trout, lake whitefish (*Coregonus clupeaformis*), deepwater chub, and yellow perch (*Perca flavescens*), fork length-at-age data were fitted to a von Bertalanffy growth curve. When sufficient data were obtained, age-at-maturity was also estimated using logistic regression. Fork length-at-age and maturity-at-age curves were generated separately for males and females of each species. The age at which 50% and 90% of the population would be mature were estimated from the logistic regression equations and reported in the text as Mat₅₀ and Mat₉₀ values, respectively (Quinn and Deriso 1999). In comparison with commercial catch data, the fishing gear used in the OSIA program under-represents the frequency of older fish caught in identical mesh sizes. This may influence estimates of growth and maturity calculated from this data alone, and must be considered when interpreting the results presented in this report. In practice, the OSIA data set is combined with data from other sampling programs when it is used to calculate estimates of various population parameters.

Average CPUE is presented for each species in the project specific summary tables. In most instances, the CPUE is simply the average number of fish of that particular species caught in nets where at least one individual of that species was recorded in the catch count. This method of calculation excludes nets where no individuals of that particular species were caught. This is

appropriate for non-target species, as in any given project, a number of nets would be set that would not be expected to catch a particular species. For example, nets targeting deepwater chub would not be expected to catch smallmouth bass, and should not be included in the calculation of average CPUE for smallmouth bass. For target species however, where nets were set to specifically capture a particular species, the average CPUE includes the catch for that species from all targeted net sets, including those nets that did not catch any of the targeted species. Target species in the OSIA program are lake whitefish, deepwater chub, yellow perch and in Cape Rich, lake trout.

Lastly, a pre-recruit index was calculated for the commercially exploited species caught in each OSIA project following Hughes (1989). The pre-recruit index uses age-specific CPUE data to infer the relative abundance of cohorts before they recruit into the commercial fishery (“pre-recruits”). The age-specific CPUE values are standardized to a value of ten to allow comparisons between year classes. Values greater than ten indicate that a year class is stronger (i.e. – has greater than average abundance) than the average for all years included in the index, while a value less than ten indicates that recruitment for that particular year class is lower than average (Mohr et al. 1997). Final index values presented in this report are an average of the index value for a year class observed at up to four different ages, depending on fish species and quota management area.

Results

Index assessment projects were conducted in southern Georgian Bay (Cape Rich), central Lake Huron (Southampton), southern Lake Huron (Grand Bend and Bayfield), western Georgian Bay (Lion’s Head and Tobermory) and in the North Channel (Clapperton Island) in 2004. The main basin projects (Southampton and Grand Bend) had two sampling periods in 2004, once in June and again in September. The location of each of these projects is illustrated in [Figure 1](#).

A total of 175 standard index nets (GL32) were set during the 2004 OSIA program. Total length of gear deployed was 68.25 km. A total of 7,017 fish of 28 different species were caught. Of these 5,405 fish were biologically sampled. The most common species were yellow perch, lake whitefish, deepwater chub, and longnose sucker (*Catostomus catostomus*). Lake trout, round whitefish (*Prosopium cylindraceum*) and alewife were frequently caught as well.

A total of 30 gill net gangs were set in southern Georgian Bay off of Cape Rich between August 9th and August 24th, 2002. All net sets were approximately 24 hours in duration. Most of the nets were set in water between 20 and 44 m deep although a couple were set in water as shallow as 15 m and as deep as 73 m. Latitude, longitude, set duration and mean water depth for the 30 nets deployed at Cape Rich are summarized in [Table 1](#). The position of each net set location is illustrated in [Figure 2](#). Twelve species of fish were caught in the Cape Rich project ([Table 2](#)). Lake whitefish were the most common species, followed distantly by lake trout. Other species were caught relatively infrequently. For the second year in a row, only one alewife was caught in the Cape Rich program.

The average CPUE for Cape Rich nets was 44.2 fish/night. Although most of the fish were caught in 51 and 64 mm mesh, significant catches were observed in all mesh sizes ([Table 2](#)). Lake whitefish had the highest average CPUE, followed by common white sucker (*Catostomus commersoni*), deepwater chub and lake trout.

Lake Whitefish

A total of 980 lake whitefish were caught in the 2004 Cape Rich project, 940 of which were biologically sampled. The mean fork length, round weight and age of lake whitefish caught in southern Georgian Bay was 298.8 ± 1.6 mm (mean $\pm$ SE), 329.4 ± 8.8 g and 3.0 ± 0.0 years, respectively ([Figure 3](#)). Most of the whitefish captured off of Cape Rich were between 225 and 325 mm fork length. Ages ranged from one to nine years. Three year old lake whitefish (the 2001 year class) were the most dominant numerically. Of the 748 lake whitefish that were sexed, 380 were female (50.8%). Male and female lake whitefish had growth curves that were virtually identical. Almost all of the lake whitefish sampled in the Cape Rich OSIA program were immature. Only nine of the 380 females were mature, while 12 of the 368 males were mature. Despite the small sample size, the maturity curves generated biologically plausible estimates for both sexes ($\text{Mat}_{50}=5.7$ and $\text{Mat}_{90}=7.0$ for males; $\text{Mat}_{50}=5.4$ and $\text{Mat}_{90}=6.1$ for females).

Lake Trout

A total of 184 lake trout were caught and of these 183 were sampled in the Cape Rich OSIA project. One unclipped lake trout was observed (0.6%). Fork length ranged from 250 mm to 740 mm with a mean of 472.2 ± 6.5 mm ([Figure 4](#)). Most of the sampled lake trout were between 375 and 575 mm fork length. The mean age of lake trout caught off of Cape Rich was 4.4 ± 0.1

years. Although lake trout from one to fourteen years of age were observed, four and five year old fish dominated the lake trout catch. Of the 183 lake trout that were sexed, 60 were female (32.8%). Growth curves for male and female lake trout were virtually identical, although males were slightly larger at very young and very old ages. Maturity curves indicate that males matured faster than females ($Mat_{50}=4.2$ and $Mat_{90}=5.3$ for males; $Mat_{50}=5.5$ and $Mat_{90}=6.4$ for females).

Deepwater Chub

A total of 64 deepwater chub were caught in the Cape Rich OSIA project, 55 of which were biologically sampled. Deepwater chub ranged in length from 168 mm to 267 mm although fish between 200 and 240 mm were the most common. The mean fork length was 219.4 ± 3.1 mm ([Figure 5](#)). The mean age of deepwater chub caught off of Cape Rich was 4.8 ± 0.1 years. Although deepwater chub from one to seven years of age were observed, four and five year old fish dominated the deepwater chub catch. Of the 55 deepwater chub that were sexed, 34 were female (61.2%). Von Bertalanffy growth curves did not fit the size at age data very well for male or female deepwater chub. No immature female chub were sampled, and only five immature males were observed. Maturity curves for male deepwater chub from southern Georgian Bay suggest that half are mature by 2.3 years of age, and 90% are mature by 5.4 years of age.

Central Lake Huron (Southampton - June) [LHA_IA04_005]

Thirty gangs of nets were deployed in central Lake Huron off of Southampton between May 31st and June 15th ([Table 3](#)). The average net set depths ranged from 12 – 74 m. All sets were single over night sets, of approximately 24 hours in duration. The net set locations are illustrated in [Figure 6](#).

A total of 13 species were caught. Alewife and lake whitefish were the most abundant species ($n=152$ and $n=117$, respectively). Other species were caught much less frequently ([Table 4](#)). No deepwater chub were caught in this project despite setting nine nets specifically targeting this species. Similarly, no yellow perch were caught in any of the six yellow perch targeted efforts, although these nets did catch considerable numbers of both alewife and round whitefish.

The average CPUE for all nets set off of Southampton in June was 14.7 fish/night and ranged from 2 to 61 fish/night. Alewife had the highest mean CPUE (6.9 fish/night) followed by lake

whitefish (6.7 fish/night) and round whitefish (4.1 fish/night). Catch-per-unit-effort for other species were noticeably lower ([Table 4](#)).

Lake whitefish were caught in all mesh sizes, but the highest whitefish catches occurred in 51 mm, 102 mm and 114 mm meshes. The 51 mm mesh also caught the most lake herring (*Coregonus artedii*), while catches in the smaller meshes (32 mm and 38 mm) were dominated by alewife ([Table 4](#)).

Lake Whitefish

A total of 117 lake whitefish were caught in the Southampton OSIA project in June, 116 of which were biologically sampled. The mean fork length of lake whitefish from central Lake Huron was 359.5 ± 11.1 mm, and ranged from 134 mm to 505 mm. The fork length distribution was distinctly tri-modal with peaks at 140, 240 and 460 mm ([Figure 7](#)). The age distribution of lake whitefish caught in this OSIA project was very uniform, with all ages between one to nine being well represented. Three year old lake whitefish (2001 year class) were particularly well represented. The mean age of lake whitefish caught in the central Lake Huron index program in June was 5.3 ± 0.3 years. A total of 113 lake whitefish could be conclusively sexed and 51 were female (45.1%). The growth curves for male and female lake whitefish were virtually identical. The maturity curves suggest that females reached sexual maturity at a slightly younger age than males ($Mat_{50}=5.3$ and $Mat_{90}=6.8$ for males; $Mat_{50}=4.8$ and $Mat_{90}=6.5$ for females).

Lake Trout

A total of 25 lake trout were caught in the central Lake Huron index project in June, all of which were biologically sampled. Fork length ranged from 353 mm to 722 mm with an average of 501.6 ± 20.2 mm ([Figure 8](#)). Twelve lake trout were aged by either CWT or year specific fin clip. Most lake trout aged by these methods were four, five or six years old, although one twelve year old fish was caught as well. Of the 25 lake trout that were sampled, 5 were unclipped (20.0 %). Eight of the 25 trout that were sampled were female (32.0%), and five of these were mature, while 11 of the 17 (64.7%) male lake trout were sexually mature.

Round Whitefish

A total of 62 round whitefish were caught in the central Lake Huron OSIA project in June, all of which were biologically sampled. The mean fork length of round whitefish caught in the central Lake Huron program in June was 338.0 ± 6.6 mm, and ranged from 260 mm to 445 mm. The fork length distribution was bimodal with peaks occurring at approximately 285 mm and 375

mm ([Figure 9](#)). The mean age of round whitefish caught in central Lake Huron was 4.8 ± 2.4 years and ranged from three to nine years. All of the sampled round whitefish could be conclusively sexed and 31 were female (50.0%). The growth curves for male and female round whitefish were very similar although females had a slight greater asymptotic length than males ($L_{\infty}=426$ mm for females versus $L_{\infty}=388$ mm for males). Male and female round whitefish appeared to reach maturity at approximately the same age, but males started to mature earlier ($Mat_{50}=4.0$ and $Mat_{90}=5.7$ for males versus $Mat_{50}=3.4$ and $Mat_{90}=6.0$ for females).

Central Lake Huron (Southampton - September)

[LHA_IA04_005]

A total of 30 gangs of nets were deployed in central Lake Huron off of Southampton between August 30th and September 15th ([Table 5](#)). The average net set depths ranged from 14 m to 105 m. All of the net sets were approximately 24 hours in duration. The net set locations are illustrated in [Figure 10](#).

A total of 16 species were caught ([Table 6](#)). Lake whitefish were the most abundant species ($n=167$), followed by deepwater chub, lake herring and alewife. Atypical species caught in the Southampton program in the fall included walleye (*Sander vitreum*), round goby (*Noegobius melanostromus*) and pink salmon (*Oncorhynchus gorbuscha*).

The average CPUE for all nets set off of Southampton in September was 25.2 fish/night and ranged from 2 to 72 fish/night. Deepwater chub had the highest mean CPUE (15.4 fish/night in targeted nets) followed by lake whitefish (12.7 fish/night), alewife (8.75 fish/night), and lake herring (7.63 fish/night).

The 51 mm mesh caught almost 65% of the deepwater chub, although they were caught in mesh as large as 102 mm. Most other species that were caught in significant numbers, were caught over a broad range of mesh sizes except for alewife. All of the alewife were caught in 32 and 38 mm mesh ([Table 6](#)). The 32mm mesh caught relatively large numbers of fish of several species including lake herring, lake whitefish and lake chub (*Couesius plumbeus*).

Lake Whitefish

A total of 167 lake whitefish were caught in the Southampton OSIA project in September, 155 of which were biologically sampled. The mean fork length of lake whitefish from this project was 201.9 ± 7.5 mm. Although the fork length ranged from 136 mm to 540 mm, the fork length distribution was skewed strongly to the right. Most of the whitefish captured in the fall Southampton OSIA project were between 200 mm and 225 mm fork length ([Figure 11](#)). Lake whitefish from one to nine years of age were caught, but one year old fish dominated the catch numerically (83.0%). As a result, the mean age of lake whitefish caught in the central Lake Huron index program was only 1.8 ± 0.1 years. Of the 47 lake whitefish that were sexed, 15 were female (31.9 %). The growth curves for male and female lake whitefish were virtually identical, as were the maturity curves ($\text{Mat}_{50} = 5.3$ and $\text{Mat}_{90} = 6.8$ for males, versus $\text{Mat}_{50} = 4.8$ and $\text{Mat}_{90} = 6.5$ for females).

Lake Trout

A total of 35 lake trout were caught in the central Lake Huron index project in September. All were biologically sampled and 24 could be aged with CWT or year specific fin clip. Observed fork lengths were broadly distributed between 205 mm and 741 mm, with a mean of 544.1 ± 15.8 mm ([Figure 12](#)). Most of the fish that could be aged were either five or six years old, although four, eight and nine year old lake trout were caught as well. Six of the 35 lake trout sampled in the fall Southampton project were unclipped (17.1%), and 16 of the 35 fish that were sexed were female (45.7%). There were too few age classes caught to generate reliable growth or maturity curves for males and females separately.

Deepwater Chub

A total of 139 deepwater chub were caught in the central Lake Huron index project in September, 137 of which were biologically sampled. Deepwater chub ranged in size from 140 mm to 276 mm fork length, with a mean fork length of 218.7 ± 1.9 mm. Sampled fish were distributed between 190 mm and 250 mm, with relatively few outside this range ([Figure 13](#)). The mean age of deepwater chub caught off of Southampton was 5.0 ± 0.1 years of age, and ranged from two to eight years old. Four and five year old chub were the most abundant age

classes, but all ages between three and seven were well represented. Of the 104 deepwater chub that could be conclusively sexed, 81 were female (77.9%). All of the deepwater chub were sexually mature. The fork length-at-age curves suggest that females reach their asymptotic length at an earlier age than males.

Yellow Perch

A total of 47 yellow perch were caught in the central Lake Huron index assessment program in September, 46 of which were biologically sampled. The mean fork length of yellow perch caught in the central Lake Huron program was 171.0 ± 5.6 mm, and ranged from 106 mm to 254 mm ([Figure 14](#)). The mean age of yellow perch caught in central Lake Huron in September was 1.7 ± 0.1 years and ranged from one to four years. One and two year old yellow perch were the most common age classes. All of the 46 yellow perch were sexed and 26 were female (56.5%). There was insufficient data to generate a growth or maturity curve for female yellow perch.

Round Whitefish

A total of 59 round whitefish were caught in the central Lake Huron index assessment program in September, all of which were biologically sampled. The mean fork length of round whitefish caught in the central Lake Huron program was 374.8 ± 5.3 mm, and ranged from 280 mm to 435 mm, although the majority of the fish sampled were between 360 and 420 mm ([Figure 15](#)). The mean age of round whitefish caught in central Lake Huron in September was 6.1 ± 0.3 years and ranged from two to nine years. Seven and eight year old round whitefish were the most common age classes, but ages three to six were well represented as well. All of the 59 round whitefish were sexed and 36 were female (61.0%). The growth curves for male and female round whitefish were similar although females had a slightly longer asymptotic length ($L_{\infty} = 426.1$ mm for females, versus $L_{\infty} = 388.1$ mm for males). The maturity curves indicate that females start to mature at a younger age than males, but both sexes reach full maturity at approximately the same age ($Mat_{50} = 4.0$ and $Mat_{90} = 5.7$ for males, versus $Mat_{50} = 3.4$ and $Mat_{90} = 6.0$ for females).

Lake Herring

A total of 110 lake herring were caught in the central Lake Huron index assessment program in September, all of which were biologically sampled. The mean fork length of lake herring caught in the central Lake Huron program was 166.5 ± 4.1 mm, and ranged from 116 mm to 246 mm. The fork length distribution was bi-modal with a sharp peak occurring between 120 and 140 mm fork length and a second, broad peak occurring between 190 and 230 mm fork length ([Figure 16](#)). Most of the lake herring were one year old, although several two year old lake herring were caught as well. No older lake herring were observed in the fall Southampton project. There were not enough age classes to calculate growth or maturity curves.

Southern Lake Huron (Grand Bend - July) [LHA_IA04_006]

Thirty gangs of gill nets were deployed in southern Lake Huron, off of Grand Bend, between June 16th and June 28th ([Table 7](#)). Set depths ranged from 12 to 64 m. All of the sets were approximately 24 hours in duration. The sampling locations are illustrated in [Figure 17](#).

A total of 13 species were observed. The catch was dominated by yellow perch (n=1619). Lake whitefish were the second most abundant species (n=126). Other species were relatively minor components of the catch numerically (i.e. < 2%). While both alewife and rainbow smelt were caught, they occurred in very low numbers (3 and 5 respectively). Round gobies were also observed ([Table 8](#)).

The overall CPUE for nets set in the southern Lake Huron offshore assessment project was 60.9 fish/night, although CPUE for individual net sets ranged from 0 to 255 fish/night. Yellow perch had the highest species specific CPUE at 95.9 fish/night, followed by lake whitefish (7.6 fish/night). The CPUE values for other species were considerably lower.

Most of the lake whitefish were caught in 32 and 51mm mesh, although at least one lake whitefish was caught in each mesh size. Although yellow perch were caught in every mesh size up to 102mm, more than 95% were caught in the 32, 38 and 51 mm mesh panels ([Table 8](#)).

Lake Whitefish

A total of 126 lake whitefish were caught in the southern Lake Huron project in July, 124 of which were biologically sampled. Lake whitefish ranged in size from 138 mm to 527 mm fork length, with a mean of 310.1 ± 10.8 mm ([Figure 18](#)). The fork length distribution observed in this project was trimodal, with peaks occurring at approximately 150, 250 and 450 mm fork length. The age of lake whitefish from the southern Lake Huron project ranged from one to eleven years of age, with a mean of 4.2 ± 0.2 years. One year old, three year old and seven year old lake whitefish were the most common age classes. There was a noticeable drop in the catch of lake whitefish older than seven years of age. A total of 104 lake whitefish were sexed and 43 were female (41.3 %). Growth curves for male and female lake whitefish were indistinguishable, while the maturity curves indicated that females reach sexual maturity at a slightly earlier age than male whitefish ($\text{Mat}_{50}=5.6$ and $\text{Mat}_{90}=7.5$ for males; $\text{Mat}_{50}=5.0$ and $\text{Mat}_{90}=6.3$ for females).

Lake Trout

Eighteen lake trout were caught off of Grand Bend in July, all of which were biologically sampled. No unclipped lake trout were observed during the early summer sampling period of this project. Lake trout ranged in size from 302 mm to 667 mm fork length and averaged 522.6 ± 27.0 mm ([Figure 19](#)). A total of 13 of the 18 lake trout could be aged by fin clip or CWT, and most of these fish were either five or six years old, although one 12 year old lake trout was caught as well. All of lake trout were sexed and 8 were female (44.4%). There was insufficient data to generate growth and maturity curves by sex.

Yellow Perch

A total of 1619 yellow perch were caught in the southern Lake Huron project in July, 1258 of which were biologically sampled. The mean fork length of yellow perch caught in the southern Lake Huron program in July was 171.0 ± 0.9 mm, and ranged from 94 mm to 383 mm, but most were between 130 mm and 210 mm ([Figure 20](#)). The fork length distribution was bimodal with a peaks occurring between 140 mm and 170 mm and 200 mm and 220 mm. The mean age of yellow perch caught in southern Lake Huron in July was 2.9 ± 0.0 years. The age of yellow perch ranged from one to eleven years, but two year old yellow perch dominated the catch. Of the 664 yellow perch that were sexed, 88 were female (13.2 %). Growth curves for male and female yellow perch were noticeably different, with females having a much larger asymptotic length ($L_{\infty}= 545.3$ mm for females versus $L_{\infty}=276.5$ mm for males). Maturity curves indicated

that males reach sexual maturity at a much younger age than females ($\text{Mat}_{50}=0.0$ and $\text{Mat}_{90}=1.0$ for males; $\text{Mat}_{50}=2.2$ and $\text{Mat}_{90}=4.4$ for females).

Southern Lake Huron (Grand Bend - September)

[LHA_IA04_006]

Twenty seven gill nets were deployed in southern Lake Huron, off of Grand Bend, between September 16th and September 30th ([Table 9](#)). Depths sampled ranged from 12 to 57 m. Inclement weather delayed the retrieval of three nets (sample numbers 669, 670 and 671). The locations of the net sets are illustrated in [Figure 21](#).

The OSIA project in southern Lake Huron in September caught the largest number of species of all of the 2004 offshore projects, a total of 20 species were observed ([Table 10](#)). Yellow perch, lake whitefish, and white sucker were the most common species. Other notable species included gizzard shad (*Dorosoma cepedianum*), round goby, lake herring, and Atlantic salmon (*Salmo salar*).

Lake Whitefish

A total of 219 lake whitefish were caught in the southern Lake Huron project in September, 202 of which were biologically sampled. Lake whitefish ranged in size from 148 to 567 mm fork length, with a mean of 212.0 ± 5.3 mm ([Figure 22](#)). Whitefish between 150 and 200 mm were the most common size class. Fish greater than 300 mm were relatively rare. The age of lake whitefish from the southern Lake Huron project ranged from one to eleven years old, with a mean of 1.7 ± 0.1 years. One year old lake whitefish were most common (more than 60% of the aged fish). Relatively few fish older than three years of age were observed. Of the 70 lake whitefish that could be sexed, 30 were female (42.9%). Growth curves for male and female lake whitefish were similar. Maturity curves for male and female lake whitefish sampled in the September project were also similar although females appeared to reach sexual maturity at a slightly earlier age than males ($\text{Mat}_{50}=5.6$ and $\text{Mat}_{90}=7.5$ for males; $\text{Mat}_{50}=5.0$ and $\text{Mat}_{90}=6.3$ for females).

Lake Trout

A total of 60 lake trout were caught off of Grand Bend in September 2004, all of which were biologically sampled. Three of these lake trout were unclipped (5.0%). Lake trout ranged in size from 365 to 694 mm fork length and averaged 551.5 ± 8.4 mm. Most of the lake trout sampled were broadly distributed between 450 and 650 mm with relatively few fish outside of this range ([Figure 23](#)). Of the 60 lake trout that were sampled, 45 could be aged by fin clip or CWT. Almost all of these fish were either five or six years old. Sex was determined for all of the sampled lake trout, 24 were female (40.0%). Maturity curves suggest both males and females mature rapidly between four and six years of age ($\text{Mat}_{50}=4.9$ and $\text{Mat}_{90}=5.0$ for males; $\text{Mat}_{50}=4.5$ and $\text{Mat}_{90}=6.0$ for females).

Yellow Perch

A total of 651 yellow perch were caught in the southern Lake Huron project in September, 2002 of which were biologically sampled. Just under half of the perch caught in this project ($n=323$), were caught in the 32 mm mesh of one net (sample number 655). The mean fork length of yellow perch caught in the southern Lake Huron project was 176.6 ± 3.2 mm, and ranged from 95 mm to 335 mm. The fork length distribution for yellow perch was distinctly bi-modal with peaks occurring at 120 mm and 210 mm ([Figure 24](#)). Few fish longer than 240 mm were observed. The mean age of yellow perch caught in southern Lake Huron was 1.8 ± 0.0 years. The age of yellow perch ranged from one to seven years but relatively few perch older than three years of age were observed. Of the 135 yellow perch were sexed, 72 were female (53.3%). The growth curves for male and female yellow perch were noticeably different with females having a longer asymptotic length ($L_{\infty}= 335.8$ mm for females versus $L_{\infty}= 242.3$ mm for males). All but 4 of the male yellow perch that were sampled were sexually mature. The maturity curve for female yellow perch suggests that that are all mature by four years of age ($\text{Mat}_{50}= 2.2$ and $\text{Mat}_{90}=4.4$ years of age).

Lake Herring

A total of 45 lake herring were caught in the southern Lake Huron project in September, 44 of which were biologically sampled. The mean fork length of lake herring caught in the southern Lake Huron program was 148.2 ± 4.4 mm, and ranged from 120 mm to 285 mm, although there were few fish longer than 170 mm ([Figure 25](#)). The mean age of lake herring caught in southern

Lake Huron was 1.1 ± 0.0 years, in fact all 43 of the 45 lake herring were one year olds. The other two lake herring were two and six years old, respectively. Of the 33 lake herring that were sexed, 17 were female (51.5%). There were not enough age classes to estimate growth or maturity curves for lake herring.

North Channel (Clapperton Island) [LHA_IA04_007]

Eighteen nets were set in the North Channel, near Clapperton Island between July 7th and 12th ([Table 11](#), [Figure 26](#)). All nets were set for approximately 24 hours. Sample depths ranged from 6 to 16 m.

Sixteen different species were caught in the North Channel project, the second highest species diversity of any 2004 OSIA project ([Table 12](#)). The most common species was white sucker (n=374) followed by yellow perch (n=160) and lake herring (n=124).

The overall CPUE for nets in the North Channel was 48.6 fish/night. The relatively high catch rates were largely attributable to white suckers which had high average, species specific CPUE values of 24.9 fish/net night. Yellow perch, lake herring and lake whitefish also had high CPUE values. The CPUE values for other species were all considerably lower. Most of the yellow perch were caught in 32 and 38 mm meshes, only 3 were caught in mesh greater than 51 mm. White sucker was the dominant species in mesh sizes larger than 89 mm while trout perch (*Percopsis omiscomaycus*), alewife, and lake chub were only caught in 32 mm mesh.

Lake Whitefish

A total of 104 lake whitefish were caught in the North Channel index, 103 of which were biologically sampled. The average size of lake whitefish caught was 339.2 ± 7.76 mm. Lake whitefish ranged in size from as small as 137 mm to as large as 558 mm fork length. The fork length distribution of lake whitefish was bimodal. Most of the lake whitefish sampled were between 250-350 mm, although a second smaller peak occurred between 450 and 500 mm ([Figure 27](#)). The age of lake whitefish in the North Channel index ranged from one to ten years old, with 3, 4 and 5 year olds being the most common ages. The mean age of lake whitefish in this index was 4.7 ± 0.2 years. Of the 98 lake whitefish that were sexed, 54 were female (55.1%). Sex specific growth and maturity curves were almost indistinguishable ($Mat_{50}=4.0$ and $Mat_{90}=6.3$ for males; $Mat_{50}=4.4$ and $Mat_{90}=6.3$ for females).

Yellow Perch

A total of 160 yellow perch were caught in the North Channel index, 153 of which were biologically sampled. The average size of yellow perch caught was 158.6 ± 2.46 mm. Yellow perch ranged in size from as small as 112 mm to as large as 335 mm fork length. Most of the yellow perch sampled were between 120-160 mm, ([Figure 28](#)). The age of yellow perch in the North Channel index ranged from one to seven years old, although 140 of the 153 fish (92.1%) were two year olds. The mean age of yellow perch in this index was 2.1 ± 0.1 years. Of the 143 yellow perch that were sexed, 106 were female (74.1%). Growth curves were noticeably different with the females having a longer asymptotic length ($L_{\infty} = 597.5$ mm for females versus $L_{\infty} = 367.1$ mm for males). Maturity curves were similar for male and female with virtually all fish reaching maturity by age 3 ($Mat_{50} = 1.7$ and $Mat_{90} = 2.1$ for males; $Mat_{50} = 2.1$ and $Mat_{90} = 2.2$ for females).

Lake Herring

A total of 124 lake herring were caught in the North Channel, of which 123 were biologically sampled. Lake herring ranged in length from 165 to 422 mm, with a mean value of 356.3 ± 4.49 mm. Most of the lake herring were between 340 and 440 mm fork length ([Figure 29](#)). The age of herring ranged from one to ten years of age, with a mean of 6.5 ± 0.2 years. Lake herring between the ages of six and eight were the most common. All but one of the sampled lake herring were sexed and 79 were female (63.7%). The sex specific growth and maturity curves were very similar, although males reached sexual maturity one year earlier than females ($Mat_{90} = 2.5$ for males versus $Mat_{90} = 3.5$ for females).

Round Whitefish

A total of 24 round whitefish were caught in the North Channel, all of which were biologically sampled. Round whitefish ranged in length from 209 to 487 mm, with a mean value of 410.3 ± 14.6 mm ([Figure 30](#)). The age of round whitefish ranged from two to twelve years of age, with a mean of 6.3 ± 0.53 years. Twelve of the 24 round whitefish were females (50%) and 11 of them were mature. Similarly, 11 of the 12 male round whitefish were mature.

Western Georgian Bay (Lion's Head and Tobermory) [LHA_IA04_009]

There were a total of 15 gill net gangs set during the Tobermory-Lion's Head OSIA program ([Table 13](#)). Ten of these nets were standard OSIA gear (GL32), while the remaining five were part of the chub-specific gear (GL19) comparison study. Net set locations and information for both gears are included here for completeness, but catch data and biological information presented is limited to standard OSIA gear only. Set depths ranged from 55 to 104 m. All the nets were deployed for approximately 24 hours except for sample numbers 954, 955 and 956 which fished for approximately three times that long. Sampling locations are illustrated in [Figure 31](#).

Only four species of fish were observed in the samples, the lowest species diversity of any offshore index site assessed in 2004 ([Table 14](#)). Deepwater chub dominated the catch (453 of 456 fish). One burbot (*Lota lota*), one lake trout, and one lake whitefish were also caught.

Almost all of the deepwater chub were caught in 38 and 51 mm mesh panels, but there was at least one individual in each mesh size up to and including 114 mm.

Deepwater Chub

A total of 453 deepwater chub were caught in standard index gear in this project, 437 of which were biologically sampled. The mean fork length of deepwater chub was 212.0 ± 1.3 mm and ranged from 95 to 292 mm. Deepwater chub between 170 and 250 mm were the most common ([Figure 32](#)). The age of deepwater chub caught in western Georgian Bay ranged from two to 11 years of age, with four, five and six year olds being the most common. There were relatively few fish older than seven years of age. The mean age of deepwater chub caught in the western Georgian Bay OSIA project was 5.0 ± 0.1 years. All of the deepwater chub that were sampled were mature, and of the 325 deepwater chub that were sexed, 250 were female (76.9%).

Pre-Recruit Indices ([Table 15](#))

Lake Whitefish

CPUE of one year old lake whitefish in both main basin index projects was the highest observed since the program switched to monofilament in 1992. In fact, the age specific CPUE was almost three times higher than any other year class as one year old fish for both projects. Unfortunately,

all of the other ages in the index continue to have age specific CPUE values that were considerably lower than the long term average.

In southern Georgian Bay, the 1999 year class continued to appear strong. This year class has been well above the long term average every year it has been observed. Subsequent year classes however, do not appear to be as robust, with index values dropping for each successive cohort. The 2000 year class has failed to appear in index gear in large numbers since 2001 when they appeared to be very strong as one-year olds. The 2001 year class has been very consistent with age specific CPUE values close to the long term average every year. The 2002 and 2003 year classes have, to this point, failed to appear in index gear in any appreciable numbers.

Deepwater Chub

Recruitment of recent cohorts of deepwater chub in central Lake Huron continues to be relatively strong, although the CPUE values for all age classes in 2004 project were considerably lower than in recent years. The catch of the 2000 year class in this year's OSIA program was above the long term average for four year old deepwater chub, but all other ages classes were close to half the long term averages for their respective ages. Unfortunately, only two deepwater chub were caught in the southern Lake Huron OSIA program, precluding calculation of index values for the second year in a row. In western Georgian Bay (GB-06), the 1999, 2000 and 2001 year classes all appear to be strong, with index values above the long term average. A virtually identical pattern was observed in north western Georgian Bay (GB-03) with the 1999, 2000 and 2001 year classes all having average CPUE values well above the long term average. The consistent pattern in both Georgian Bay indices suggests that strong recruitment of deepwater chub may be occurring over a relatively broad area. However, pre-recruitment indices for this species may be biased given that there is some evidence to suggest that deepwater chub are fully recruited at age four. Pre-recruitment calculations may need to be revisited in future OSIA programs to address this issue.

Yellow Perch

Yellow perch recruitment in central Lake Huron continues to be sporadic. The CPUE of one year old yellow perch in the central Lake Huron index in 2004 was the highest observed since the 1998 year class. However, older age classes were well below the long term average and the total numbers of yellow perch caught in this project remains extremely low. Catches of yellow perch in the southern Lake Huron have been much more consistent through time, but show a similar pattern in year class strength. The CPUE of one year old yellow perch in 2004 was very high, second only to the 1998 year class. Other year classes currently in the index (the 2001 and

2002 year classes) were below the long term average. In the North Channel, the 1998 year class continues to influence the index. Subsequent year classes have been considerably weaker and all of the year classes in the 2004 index (2001-2003 inclusive) were well below the long term averages for their respective ages.

Discussion

A total of 28 different species were caught in the 2004 OSIA program, within the range typically observed. On a lake-wide basis, the most common species were yellow perch, lake whitefish, and deepwater chub. Lake trout continue to be relatively abundant, especially in the main basin and southern Georgian Bay but for the first time since the mid-1980s there were almost as many lake herring as lake trout (301 versus 324, respectively). Relative to the 2003 OSIA program, catches of lake whitefish were up slightly, as were catches of white sucker, longnose sucker, trout perch and lake chub. The numbers of yellow perch were up substantially from 2003, largely due to several nets set in southern Lake Huron that caught more than 100 perch each. Catches of lake trout, walleye, burbot and alewife were all down relative to 2003.

For the fifth consecutive year, round gobies were caught in the southern Lake Huron project, although the number caught was down substantially from 2003. Only eight round gobies were caught in 2004, compared to 53 a year earlier. Round gobies were observed in the catch count of central Lake Huron index for the second year in a row. To date, round goby have not appeared in the catch count or diet data of any other OSIA project.

Lake Whitefish Trends

Lake whitefish were caught over a broad range of sizes and age classes in the 2004 OSIA program, but the 2003 year class was extremely well represented, especially in the main basin projects. In these projects, the overall CPUE is consistent with catches observed over the past several years, although much lower than those recorded in the early to mid 1990s. However, one year old whitefish (the 2003 year class) dominated the catches in September and October in both Southampton and Grand Bend projects. The apparent strength of the 2003 year class is encouraging, as recruitment of year classes since 1998 has been sporadic and unreliable. In fact, in both projects, the age specific CPUE for the 2003 year class as one year olds was three times higher than any other year class since the OSIA project switched to monofilament nets in 1992. The same trend was not apparent in the southern Georgian Bay index. The overall catch of lake whitefish in Cape Rich was higher than the last two years and well within the range observed in the last decade, but it was the 2001 year class that made up the bulk of catch. This year class had

the highest age specific CPUE as three year olds of any year class since 1992. The 2003 year class was not observed in this index program.

The overall catch of lake whitefish in the North Channel was intermediate to those observed in the Cape Rich and the main basin projects, but was the highest recorded in this program since it started in 1993. The catch consisted of a broad range of age classes with three, four and five year old fish making up the bulk of the catch. Like southern Georgian Bay, fish younger than three years of age were a relatively small component of the catch.

Lake Trout Trends

The catch of lake trout in southern Georgian Bay continues to slowly decline. The average catch in 2004 is consistent with a trend that started in 1993. Over this period, the mean age has remained close to four years of age while the mean number of lake trout caught per net has dropped from 38.1 in 1993 to 6.1 in 2004. The catch of the 2004 index program was dominated by four and five year old fish, with few fish any older. A similar age distribution was observed in the main basin projects as well, with four and five year old lake trout dominating the catch in Southampton and five and six year olds dominating the catch in southern Lake Huron. The catch of lake trout in main basin projects has never been as high as southern Georgian Bay, but has been steady over the past several years. Once again, the Southampton project had the highest proportion of unclipped lake trout (11/60) observed in the OSIA program. Only four other unclipped lake trout were recorded in all other projects combined.

Yellow Perch Trends

Overall, yellow perch catches are also down from historical levels. Yellow perch catches have been declining in all OSIA programs since the late 1990's. This trend continued in 2004. Although catches in southern Lake Huron were respectable (n=1,619 and n=651, for the spring and fall projects, respectively), the catches were well below the historical peaks that occurred in the late 1980's and early 1990's. However, the pre-recruit index suggests that the 2003 year class is the strongest in this part of the lake since 1998 and the second strongest since the OSIA program switched to monofilament gill nets. The other ages in the pre-recruit index had age specific CPUE values that were well within the ranges typically observed in this program. The abundance of yellow perch of any age continues to be very low in central Lake Huron and in the North Channel, the catch of yellow perch continues to be relatively low as well, although it is up slightly from 2003. This increase in the North Channel is largely attributable to the 2002 year class, although even then, the age specific CPUE for these fish as two year olds is less than a quarter of the CPUE values observed for yellow perch of that age in this project between 1997

and 1999. The 2003 year-class was not detected in either the central main basin or North Channel index program.

Deepwater Chub Trends

The decline in the CUE of deepwater chub was evident in both Cape Rich and Southampton projects, but was most pronounced in southern Lake Huron where only two deepwater chub were caught, despite having six nets set in water deeper than 60 m. In Southampton, the CUE was also down, continuing a trend that started in the early to mid 1990's. Although the catch consisted of a relatively broad range of ages, recruitment of the most recent year classes (since 2001) appear to be down and year classes that were abundant in previous index programs were not caught in large numbers in 2004 (e.g. – the 1999 and 2000 year classes). These trends contrast sharply with the trends observed in western Georgian Bay, where the 1999 to 2001 year classes of deepwater chub are all strong. In fact, the recruitment of deepwater chub year classes to index gear in western Georgian Bay has been at or above the long term average since 1995.

Summary

All of the projects planned for 2004 were completed successfully. While the 2003 year class of lake whitefish, yellow perch and especially lake herring appear to be relatively strong, overall abundance of fish in general was relatively low. For the first time since 1985, there was an index net set that failed to catch a single fish of any species. In fact, there were three such nets set in the 2004 program (sample numbers 529, 602 and 676). All three samples were set in the main basin, two were targeting deepwater chub in water more than 60 m deep, while one was set in water less than 20 m deep off of Grand Bend.

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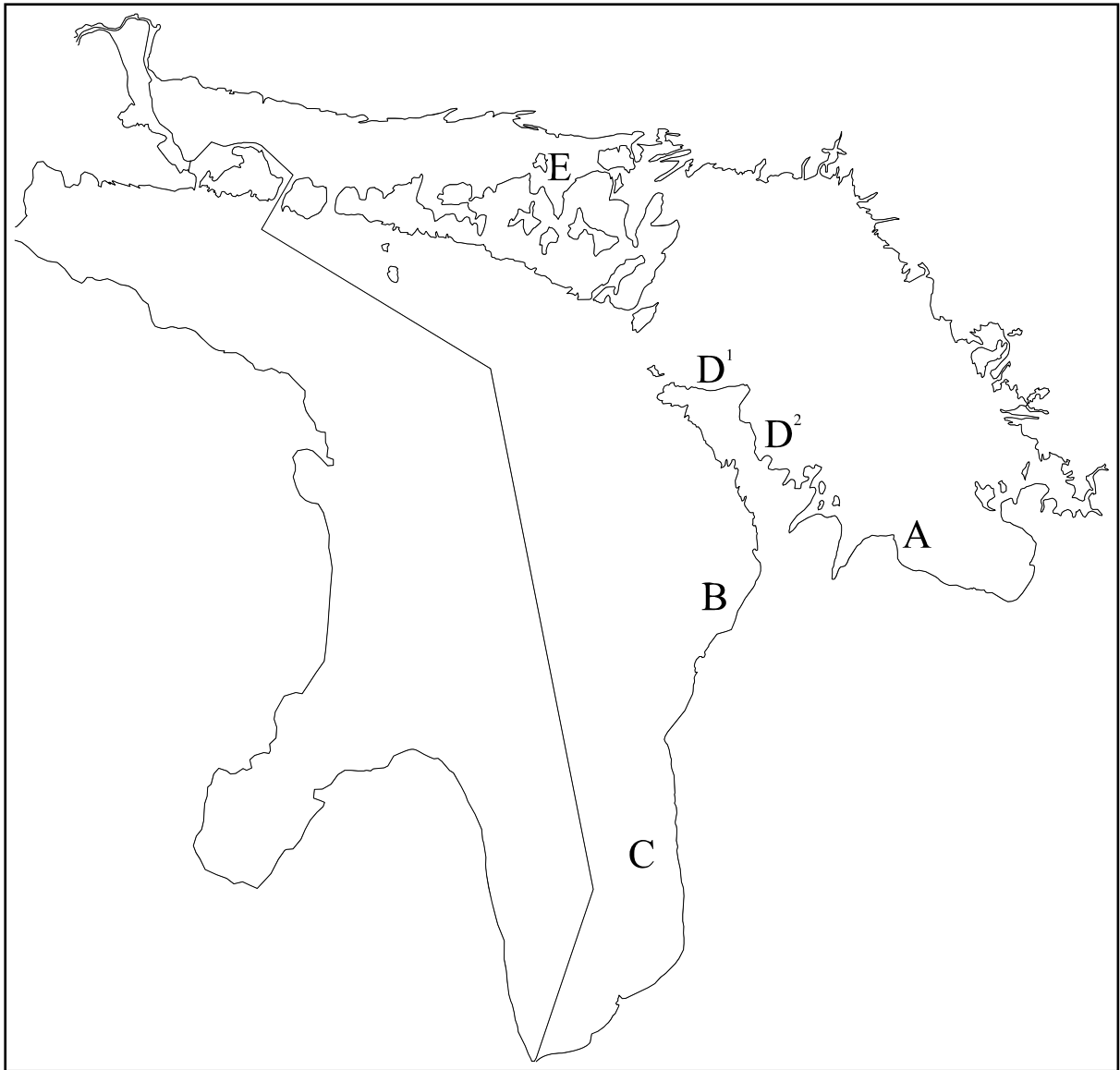


Figure 1. General locations of offshore index assessment programs conducted in Lake Huron in 2004. Index assessment programs were conducted in Georgian Bay near Cape Rich (A), Tobermory (D¹), and Lion's Head (D²); in the main basin near Southampton (B) and Bayfield (C); and in the North Channel near Clapperton Island (E).

Table 1. Sample number, set date, latitude, longitude, effort duration (hours) and average water depth of experimental gill nets gangs set in southern Georgian Bay, 2004.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
201	09-Aug-04	44° 42.10'	-080° 35.24'	GL32	22.76	38.85
202	09-Aug-04	44° 43.01'	-080° 35.71'	GL32	22.98	34.91
203	09-Aug-04	44° 40.44'	-080° 36.03'	GL32	22.63	38.96
204	10-Aug-04	44° 38.70'	-080° 36.78'	GL32	21.51	25.05
205	10-Aug-04	44° 39.01'	-080° 37.01'	GL32	22.01	21.26
206	10-Aug-04	44° 39.42'	-080° 37.13'	GL32	22.56	17.81
207	11-Aug-04	44° 37.39'	-080° 33.93'	GL32	22.90	30.68
208	11-Aug-04	44° 37.48'	-080° 33.04'	GL32	22.98	33.48
209	11-Aug-04	44° 36.97'	-080° 31.84'	GL32	23.13	31.86
210	12-Aug-04	44° 41.69'	-080° 31.77'	GL32	21.53	50.58
211	12-Aug-04	44° 41.02'	-080° 33.06'	GL32	21.65	49.88
212	12-Aug-04	44° 40.78'	-080° 33.79'	GL32	21.83	51.81
213	16-Aug-04	44° 42.83'	-080° 36.95'	GL32	22.63	28.07
214	16-Aug-04	44° 42.03'	-080° 36.70'	GL32	21.81	27.08
215	16-Aug-04	44° 41.15'	-080° 36.59'	GL32	21.05	28.29
216	17-Aug-04	44° 38.91'	-080° 33.66'	GL32	22.83	47.41
217	17-Aug-04	44° 39.31'	-080° 33.09'	GL32	22.21	60.75
218	17-Aug-04	44° 39.46'	-080° 32.14'	GL32	21.60	73.56
219	18-Aug-04	44° 39.57'	-080° 36.50'	GL32	22.46	30.96
220	18-Aug-04	44° 39.03'	-080° 36.84'	GL32	21.73	33.41
221	18-Aug-04	44° 38.51'	-080° 36.38'	GL32	20.98	30.35
222	19-Aug-04	44° 42.64'	-080° 37.42'	GL32	23.51	15.42
223	19-Aug-04	44° 41.56'	-080° 37.16'	GL32	23.56	20.64
224	19-Aug-04	44° 41.10'	-080° 36.94'	GL32	23.75	24.91
225	23-Aug-04	44° 39.90'	-080° 36.52'	GL32	24.16	40.37
226	23-Aug-04	44° 39.26'	-080° 36.42'	GL32	23.50	42.61
227	23-Aug-04	44° 38.78'	-080° 36.47'	GL32	22.95	40.45
228	24-Aug-04	44° 38.61'	-080° 31.90'	GL32	21.83	41.48
229	24-Aug-04	44° 38.39'	-080° 32.49'	GL32	21.23	38.53
230	24-Aug-04	44° 38.15'	-080° 33.62'	GL32	20.63	37.54

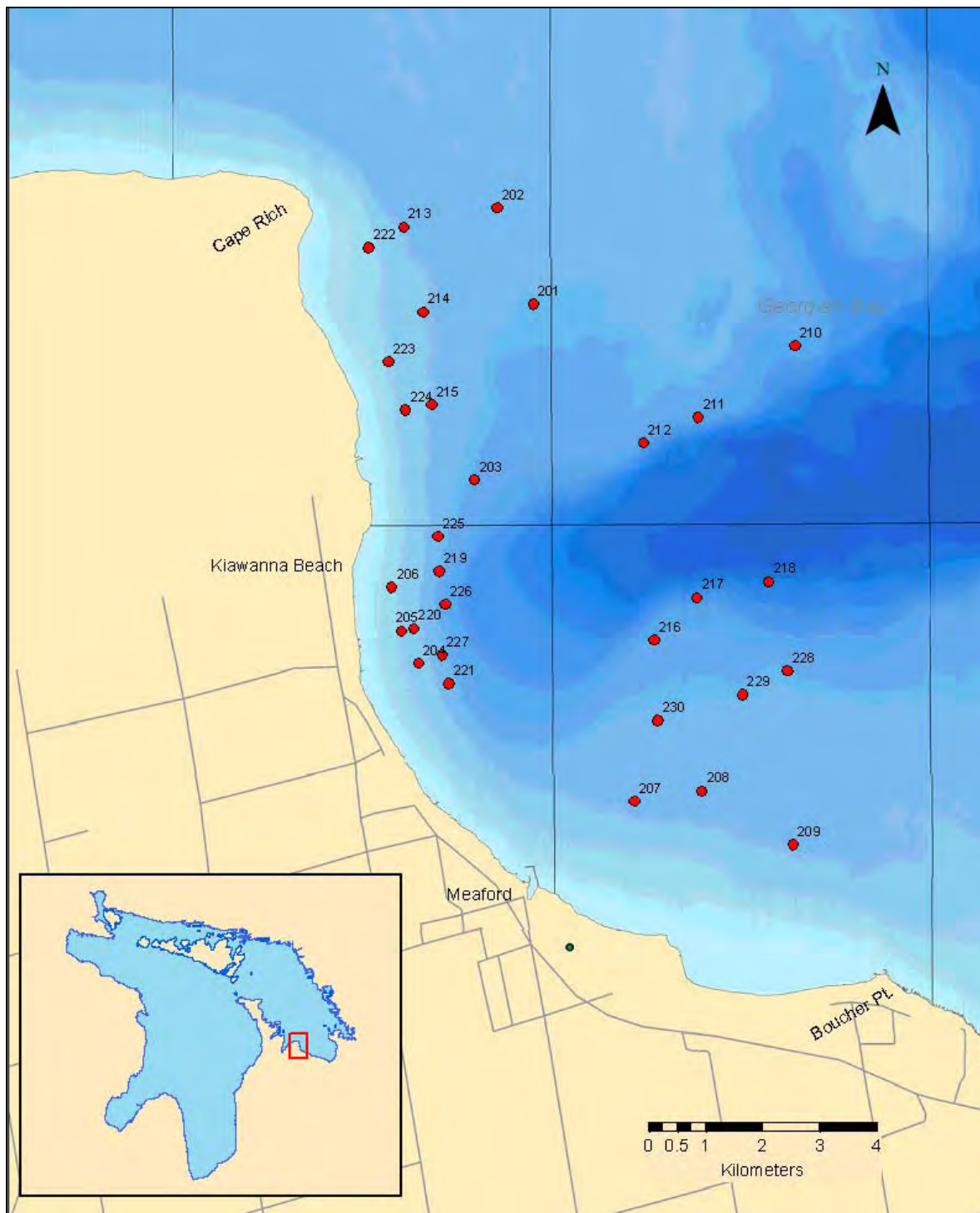


Figure 2. Offshore index sampling locations in southern Georgian Bay near Cape Rich. Nets were set to target lake whitefish and lake trout. (Project code LHA_IA04_002).

Table 2. Count of fish by species caught in each mesh size of experimental gill nets set in southern Georgian Bay, August 2004. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE. For the target species (deepwater chub, lake whitefish and yellow perch), all net sets targeted on that particular species were included in CPUE calculations, whether the target species was caught or not. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
alewife		1								1	1.00
burbot				2	1	1				4	1.33
chinook salmon	1	5	8	1	3	3	1			22	3.66
chub	10	17	31	4	2					64	9.14
lake trout	2	1	5	15	29	42	38	35	17	184	7.36
lake whitefish	9	17	230	497	160	36	22	7	2	980	32.66
longnose sucker		1	1		2			1		5	2.50
rainbow smelt	1		2			1				4	1.33
rainbow trout		1	5		1				1	8	2.00
round whitefish			1		1	2				4	1.00
smallmouth bass			1							1	1.00
white sucker	2	2	2	2	4	4	17	13	4	50	10.00
Total	25	45	286	521	203	89	78	56	24	1327	

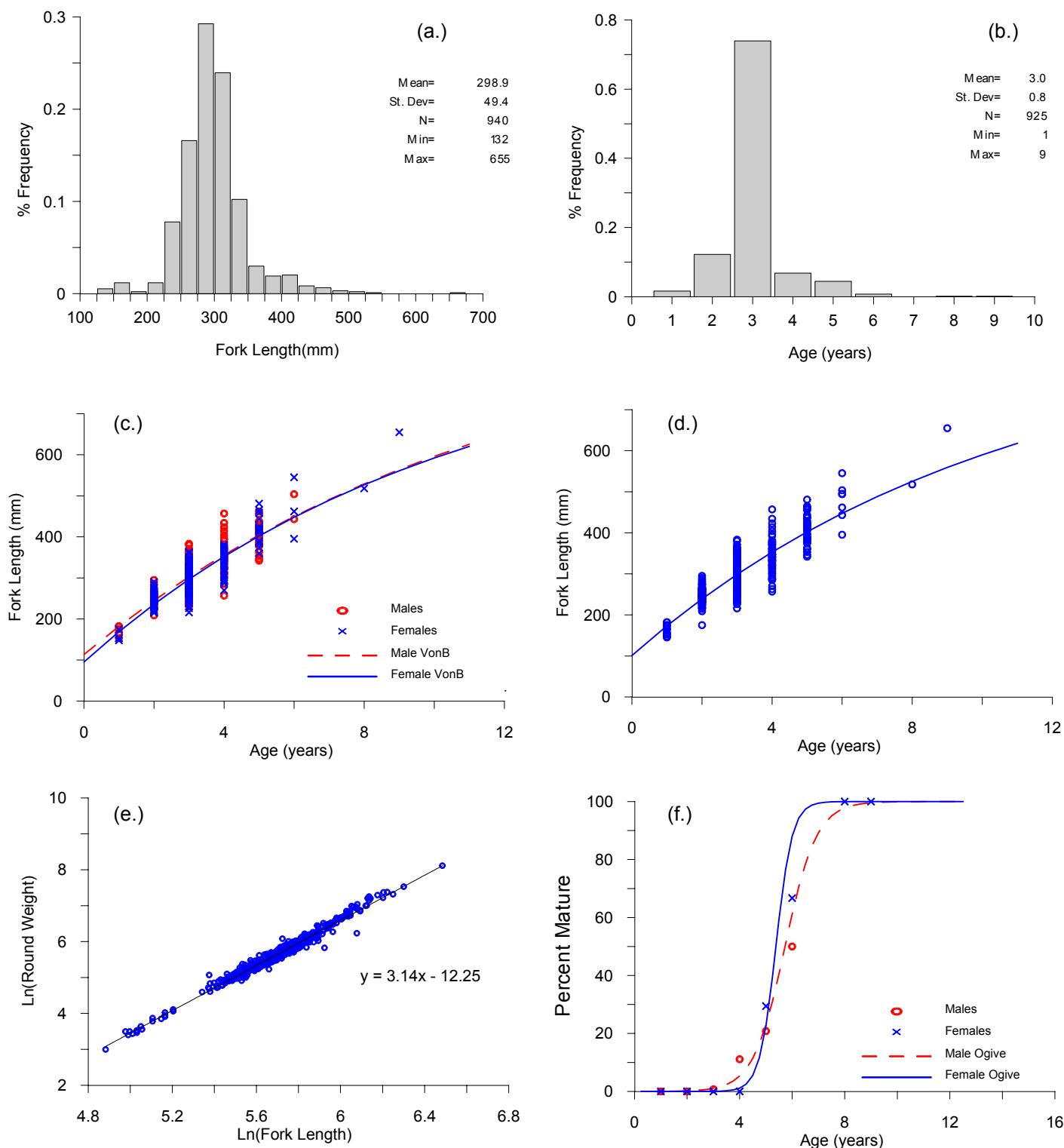


Figure 3. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake whitefish caught in the 2004 Cape Rich OSIA project (LHA_IA04_002). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=960.6$, $k=0.084$, $t_0=-1.49$ for males (dashed line), while parameter estimates for the females were $L_{inf}=900$, $k=0.096$, $t_0=-1.16$ (solid line). Maturity curves were estimated using logistic regression.

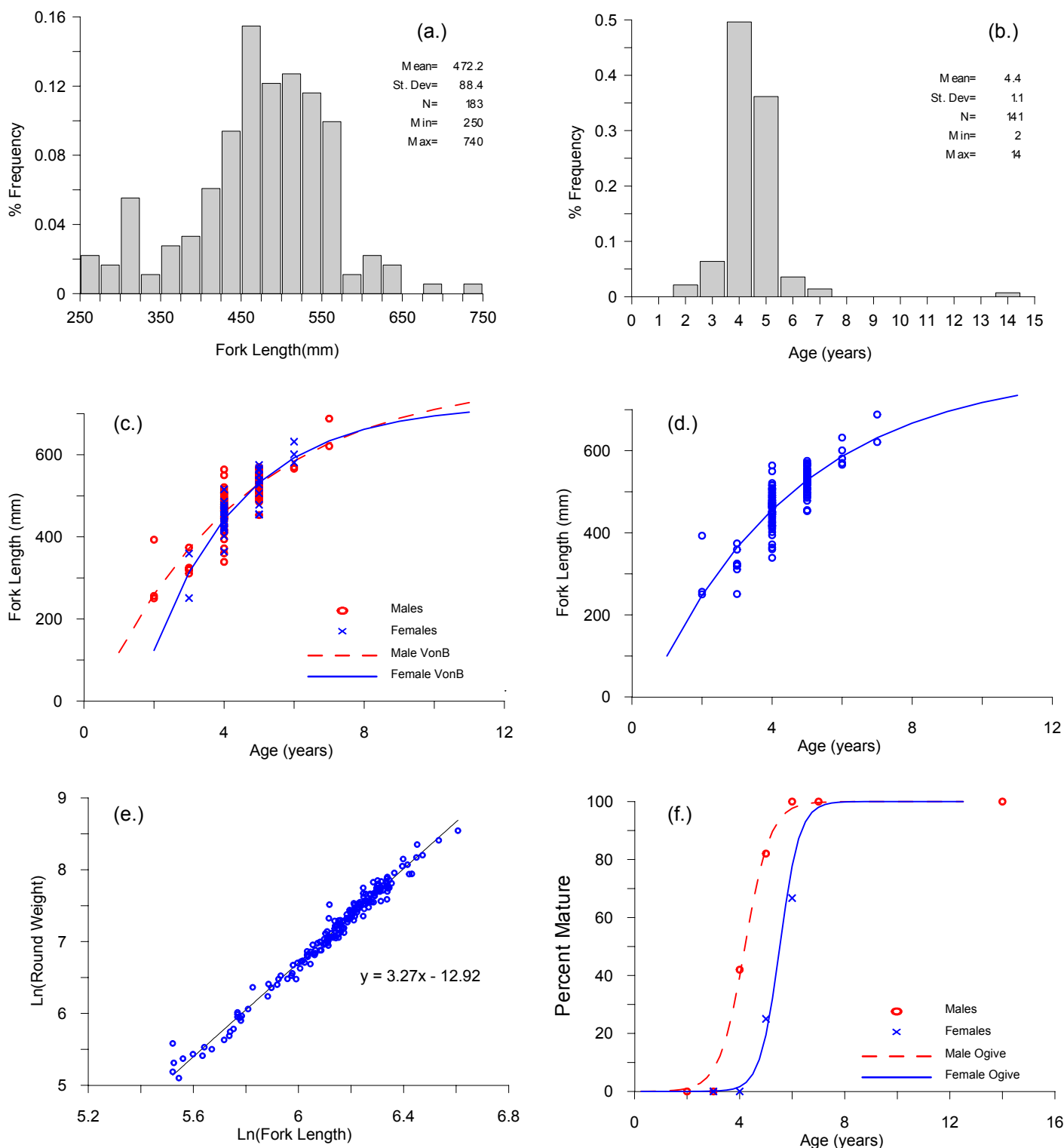


Figure 4. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake trout caught in the 2004 Cape Rich OSIA project (LHA_IA04_002). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=789.5$, $k=0.237$, $t_0=0.32$ for males (dashed line), while parameter estimates for the females were $L_{inf}=723$, $k=0.382$, $t_0=1.51$ (solid line). Maturity curves were estimated using logistic regression.

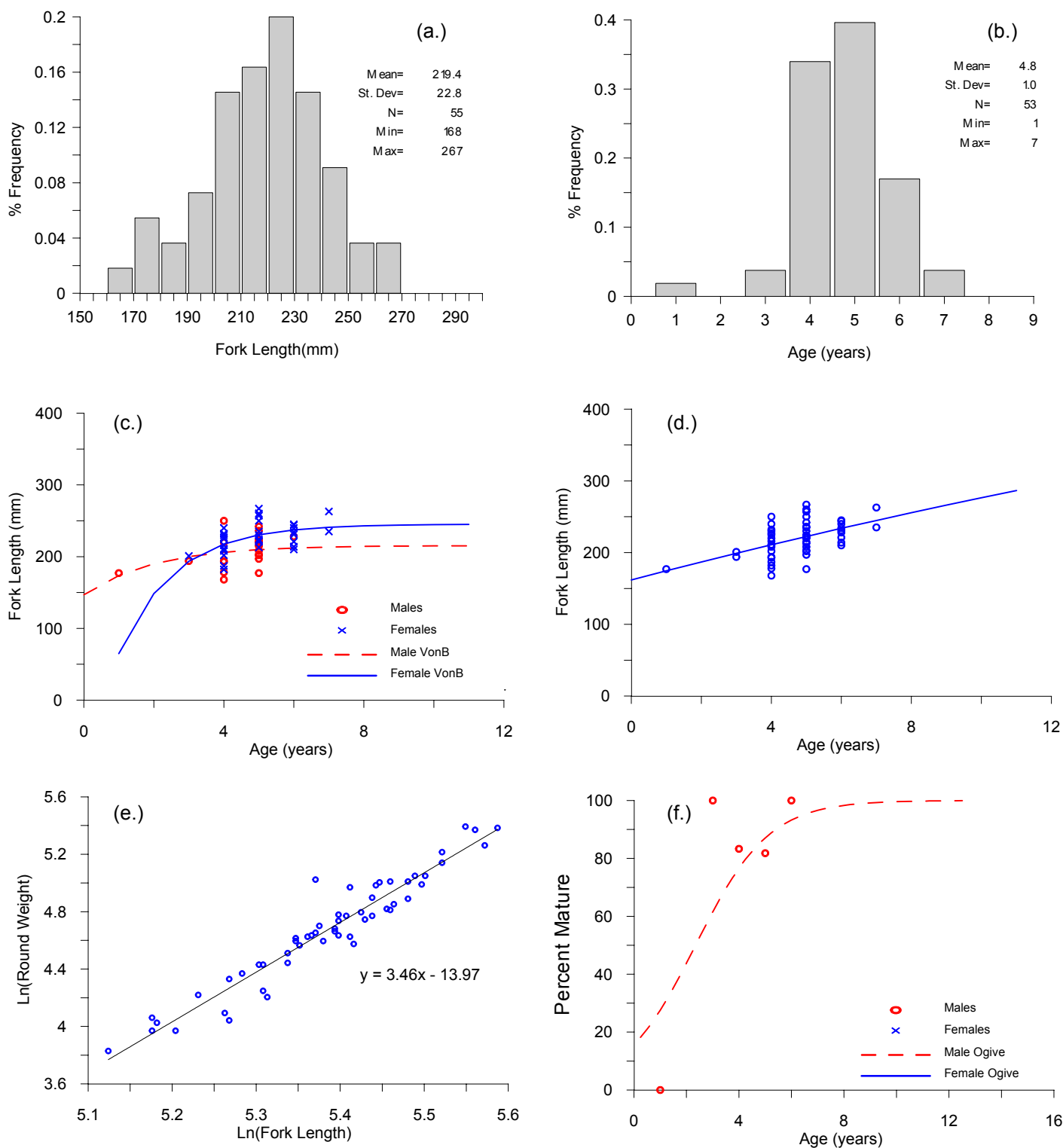


Figure 5. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of chub caught in the 2004 Cape Rich OSIA project (LHA_IA04_002). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=215.5$, $k=0.497$, $t_0=-2.3$ for males (dashed line), while parameter estimates for the females were $L_{inf}=245.3$, $k=0.624$, $t_0=0.51$ (solid line). There was insufficient data to generate a maturity curve for males.

Table 3. Sample number, set date, latitude, longitude, effort duration (hours) and average water depth of experimental gill nets gangs set in central Lake Huron, June 2004.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
501	31-May-04	44° 29.92'	-081° 24.90'	GL32	22.15	13.01
502	31-May-04	44° 30.29'	-081° 25.08'	GL32	21.61	15.18
503	31-May-04	44° 30.68'	-081° 24.45'	GL32	21.03	14.53
504	01-Jun-04	44° 32.48'	-081° 30.34'	GL32	18.55	48.96
505	01-Jun-04	44° 33.02'	-081° 30.30'	GL32	18.78	49.67
506	01-Jun-04	44° 33.38'	-081° 29.50'	GL32	18.95	47.88
507	02-Jun-04	44° 37.48'	-081° 22.19'	GL32	25.88	29.10
508	02-Jun-04	44° 36.75'	-081° 21.89'	GL32	25.16	28.73
509	02-Jun-04	44° 35.83'	-081° 22.23'	GL32	24.46	27.22
510	03-Jun-04	44° 37.53'	-081° 20.37'	GL32	20.20	21.02
511	03-Jun-04	44° 36.99'	-081° 20.19'	GL32	19.56	20.66
512	03-Jun-04	44° 36.36'	-081° 19.93'	GL32	18.98	18.54
513	07-Jun-04	44° 40.57'	-081° 19.31'	GL32	22.03	14.07
514	07-Jun-04	44° 41.37'	-081° 18.99'	GL32	22.21	12.60
515	07-Jun-04	44° 42.45'	-081° 19.06'	GL32	22.40	13.05
516	08-Jun-04	44° 42.52'	-081° 22.40'	GL32	22.10	27.80
517	08-Jun-04	44° 41.79'	-081° 22.60'	GL32	22.23	27.64
518	08-Jun-04	44° 41.20'	-081° 22.47'	GL32	22.43	27.52
519	09-Jun-04	44° 36.69'	-081° 23.63'	GL32	22.33	28.73
520	09-Jun-04	44° 35.97'	-081° 23.88'	GL32	21.70	33.09
521	09-Jun-04	44° 35.13'	-081° 23.37'	GL32	20.90	31.92
522	10-Jun-04	44° 43.11'	-081° 29.09'	GL32	24.11	56.31
523	10-Jun-04	44° 42.53'	-081° 29.27'	GL32	24.48	56.44
524	10-Jun-04	44° 42.05'	-081° 29.01'	GL32	24.60	57.09
525	14-Jun-04	44° 40.22'	-081° 24.35'	GL32	23.46	31.26
526	14-Jun-04	44° 39.75'	-081° 24.04'	GL32	23.60	33.61
527	14-Jun-04	44° 38.67'	-081° 24.03'	GL32	24.10	34.96
528	15-Jun-04	44° 33.02'	-081° 34.00'	GL32	19.45	73.88
529	15-Jun-04	44° 32.42'	-081° 34.01'	GL32	19.73	73.27
530	15-Jun-04	44° 31.46'	-081° 33.99'	GL32	19.95	62.58

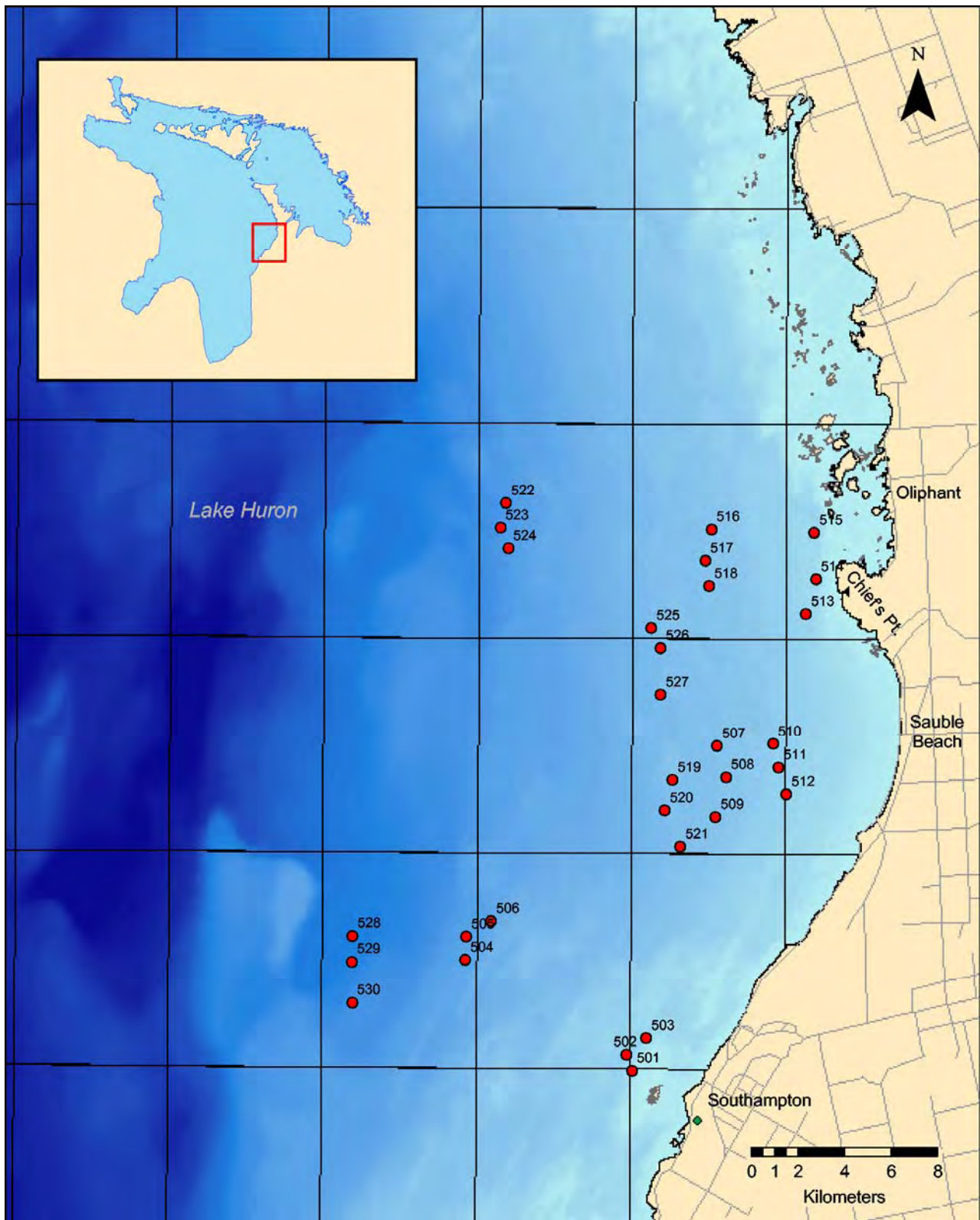


Figure 6. Offshore index sampling locations in central Lake Huron near Southampton targeting lake whitefish, deepwater chub and yellow perch. Nets were set in June 2004. (Project code LHA_IA04_005).

Table 4. Count of fish by species caught in each mesh size of experimental gill nets set in southern central Lake Huron, June 2004. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE. For the target species (deepwater chub, lake whitefish and yellow perch), all net sets targeted on that particular species were included in CPUE calculations, whether the target species was caught or not. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
alewife	50	95	7							152	6.91
burbot	2		5	10	4	1				22	2.44
chinook salmon						1				1	1.00
lake chub	1									1	1.00
lake herring	8	1			1					10	2.00
lake trout			1	4	7	6	3	2	2	25	1.47
lake whitefish	12	2	28	2	1	18	27	23	4	117	6.67
longnose sucker		3	9	1	2	1	2	2		20	2.50
rainbow smelt	3			1						4	1.00
round goby	3	2								5	1.67
round whitefish			29	24	6	2	1			62	4.13
white sucker		1			3	1				5	1.67
yellow perch			1							1	0.00
Total	79	104	80	42	24	30	33	27	6	425	

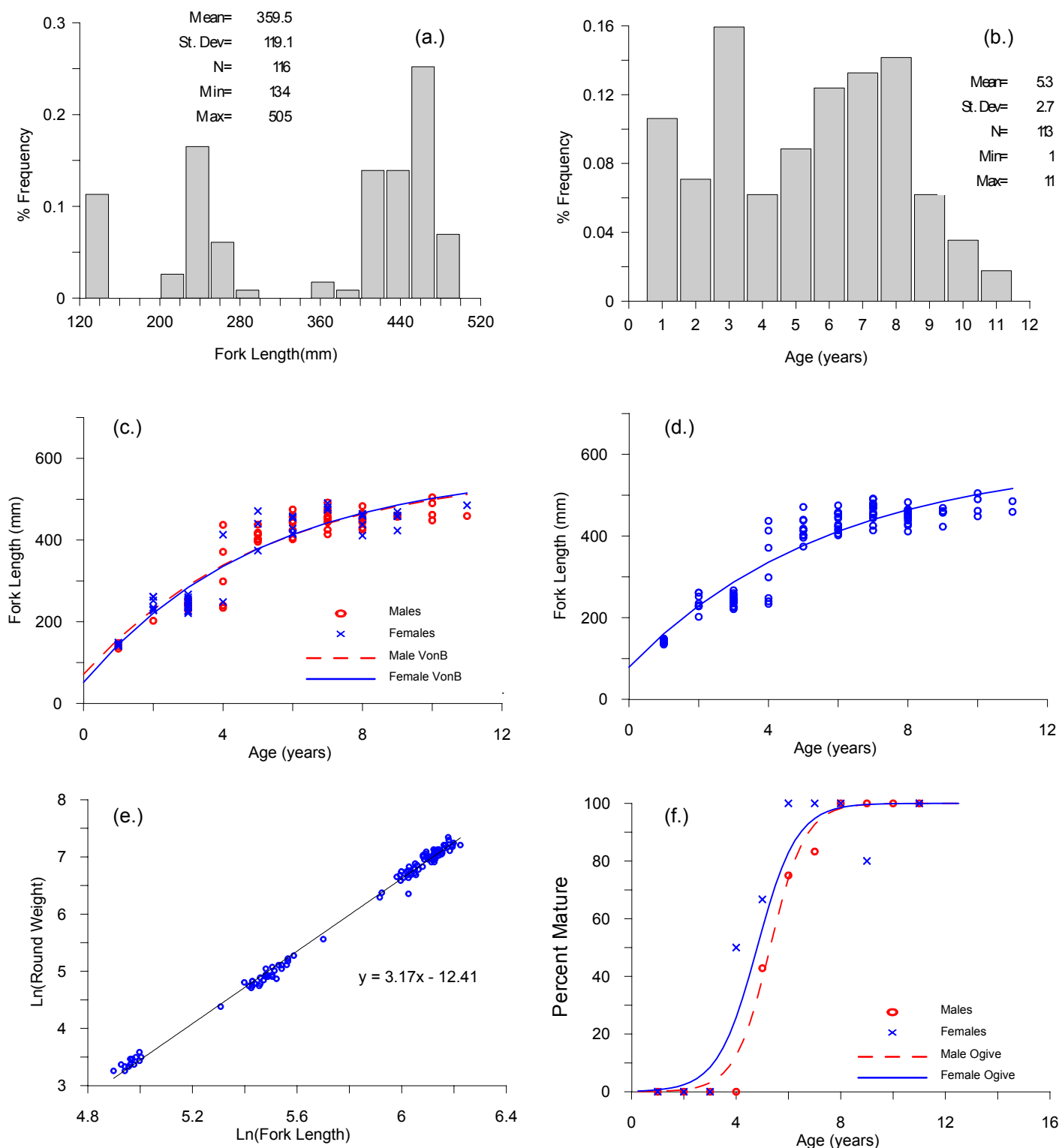


Figure 7. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake whitefish caught in the Spring 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $\text{Linf}=573.8$, $k=0.19$, $t_0=-0.7$ for males (dashed line), while parameter estimates for the females were $\text{Linf}=576.6$, $k=0.195$, $t_0=-0.48$ (solid line). Maturity curves were estimated using logistic regression.

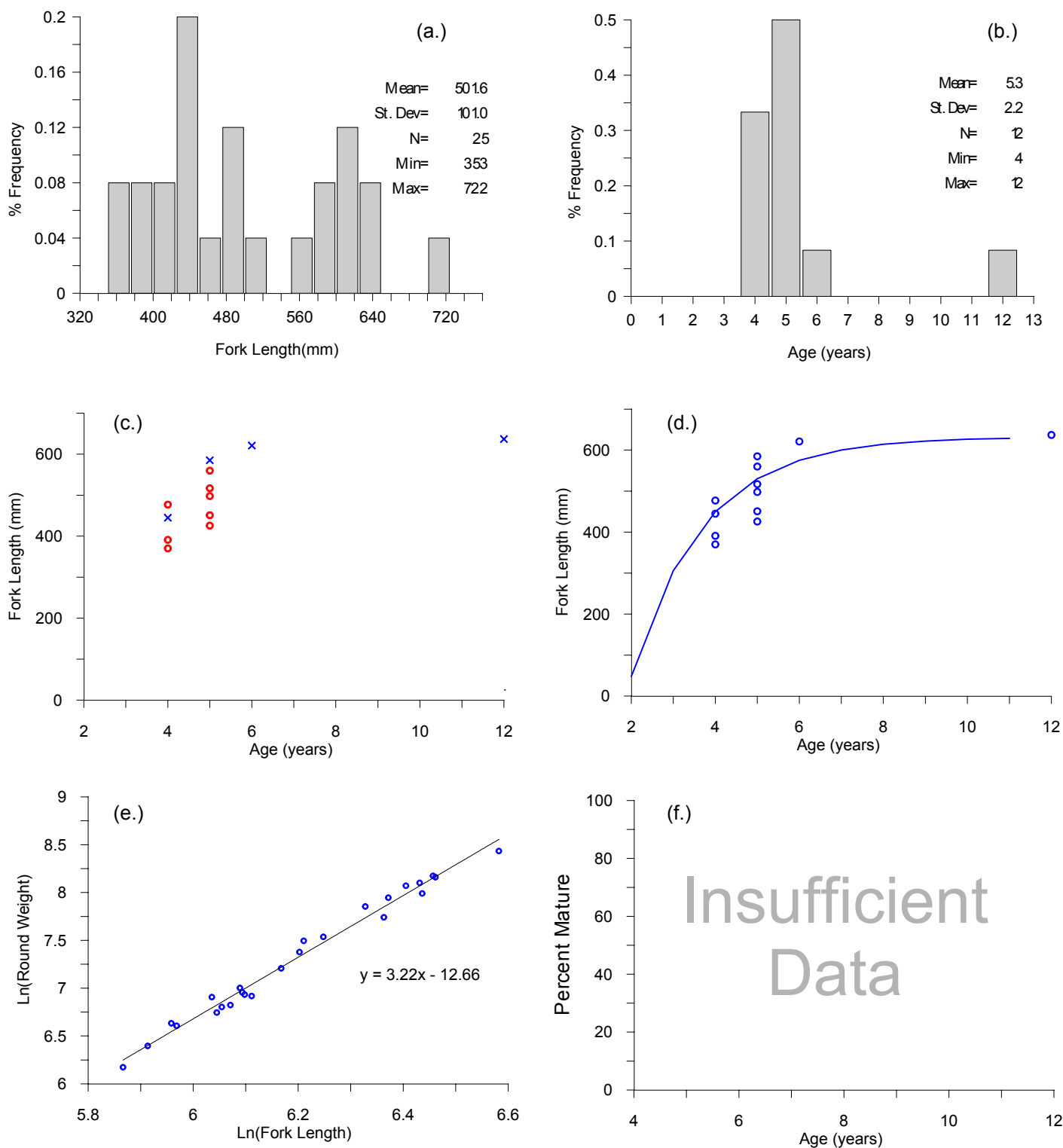


Figure 8. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake trout caught in the Spring 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). There was insufficient data to estimate sex specific growth or maturity curves.

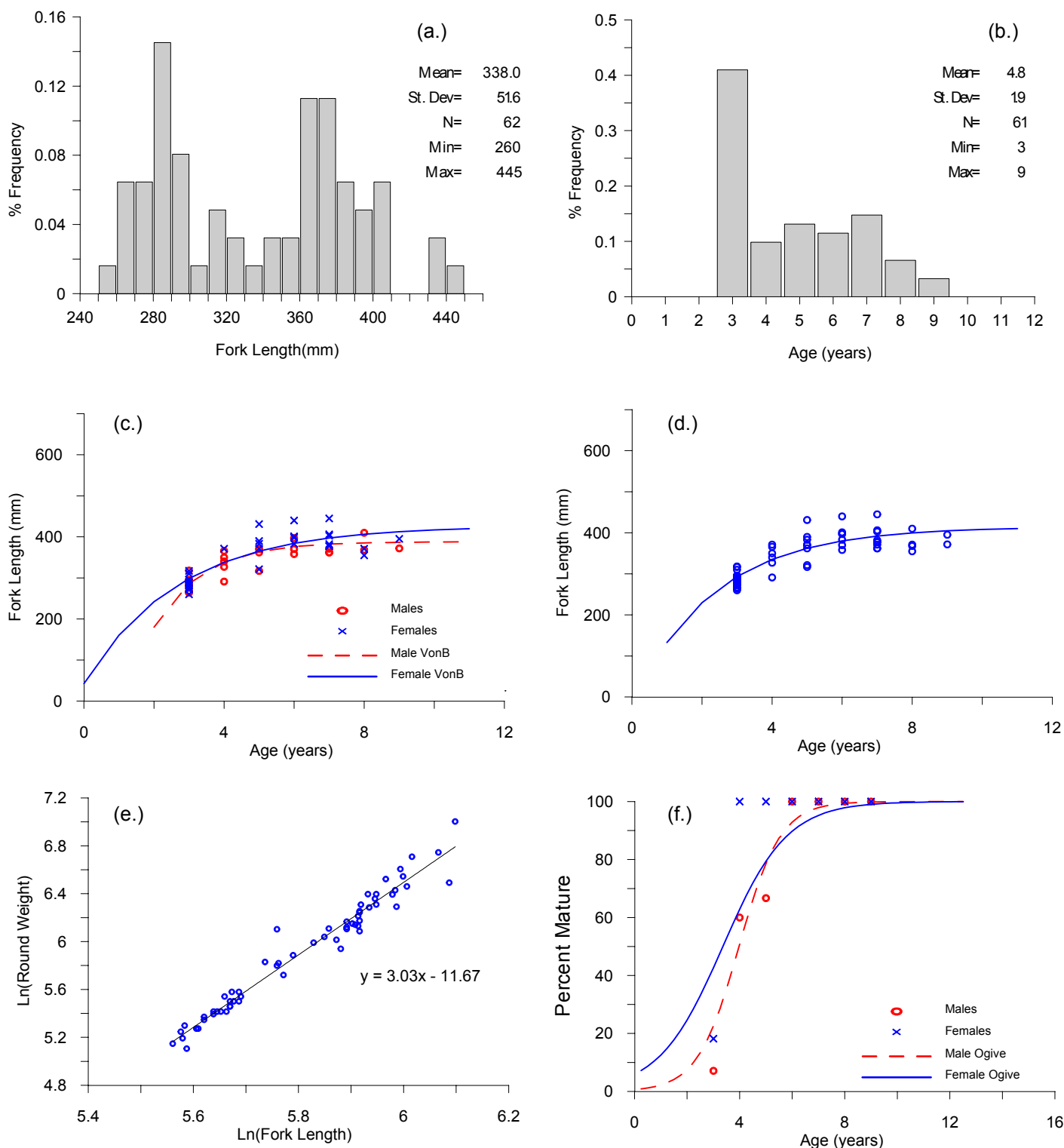


Figure 9. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of round whitefish caught in the Spring 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=388.1$, $k=0.717$, $t_0=1.13$ for males (dashed line), while parameter estimates for the females were $L_{inf}=426.8$, $k=0.367$, $t_0=-0.28$ (solid line). Maturity curves were estimated using logistic regression.

Table 5. Sample number, set date, latitude, longitude, effort duration in hours, and average water depth of experimental gill nets gangs set in central Lake Huron, September 2004.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
551	30-Aug-04	44° 33.46'	-081° 38.97'	GL32	24.18	89.82
552	30-Aug-04	44° 34.15'	-081° 39.29'	GL32	23.35	99.25
553	30-Aug-04	44° 34.87'	-081° 38.81'	GL32	22.46	104.52
554	31-Aug-04	44° 32.17'	-081° 32.17'	GL32	22.61	62.40
555	31-Aug-04	44° 32.68'	-081° 31.43'	GL32	21.85	62.23
556	31-Aug-04	44° 33.42'	-081° 31.05'	GL32	21.11	57.97
557	01-Sep-04	44° 29.70'	-081° 25.70'	GL32	21.86	17.35
558	01-Sep-04	44° 30.04'	-081° 24.84'	GL32	21.30	13.36
559	01-Sep-04	44° 30.55'	-081° 24.87'	GL32	20.75	17.36
560	02-Sep-04	44° 43.39'	-081° 29.46'	GL32	23.63	55.66
561	02-Sep-04	44° 42.67'	-081° 29.09'	GL32	22.91	55.87
562	02-Sep-04	44° 41.93'	-081° 29.70'	GL32	22.23	59.52
563	07-Sep-04	44° 42.68'	-081° 22.74'	GL32	23.80	28.53
564	07-Sep-04	44° 41.97'	-081° 22.78'	GL32	23.03	27.77
565	07-Sep-04	44° 41.44'	-081° 22.14'	GL32	24.00	26.56
566	08-Sep-04	44° 42.27'	-081° 19.33'	GL32	22.18	14.12
567	08-Sep-04	44° 41.36'	-081° 19.58'	GL32	22.41	15.95
568	08-Sep-04	44° 40.57'	-081° 19.00'	GL32	22.56	15.95
569	09-Sep-04	44° 36.91'	-081° 20.62'	GL32	21.54	22.42
570	09-Sep-04	44° 36.37'	-081° 20.98'	GL32	21.83	21.79
571	09-Sep-04	44° 35.50'	-081° 20.81'	GL32	22.05	20.37
575	13-Sep-04	44° 37.57'	-081° 22.25'	GL32	23.85	28.82
576	13-Sep-04	44° 36.54'	-081° 21.76'	GL32	22.98	14.91
577	13-Sep-04	44° 36.50'	-081° 21.60'	GL32	22.56	25.07
578	14-Sep-04	44° 39.45'	-081° 19.27'	GL32	23.73	15.08
579	14-Sep-04	44° 38.38'	-081° 18.76'	GL32	24.00	14.91
580	14-Sep-04	44° 38.22'	-081° 18.73'	GL32	23.78	15.15
581	15-Sep-04	44° 31.97'	-081° 26.78'	GL32	19.71	32.09
582	15-Sep-04	44° 31.32'	-081° 27.35'	GL32	20.03	29.53
583	15-Sep-04	44° 30.67'	-081° 27.45'	GL32	20.21	21.67

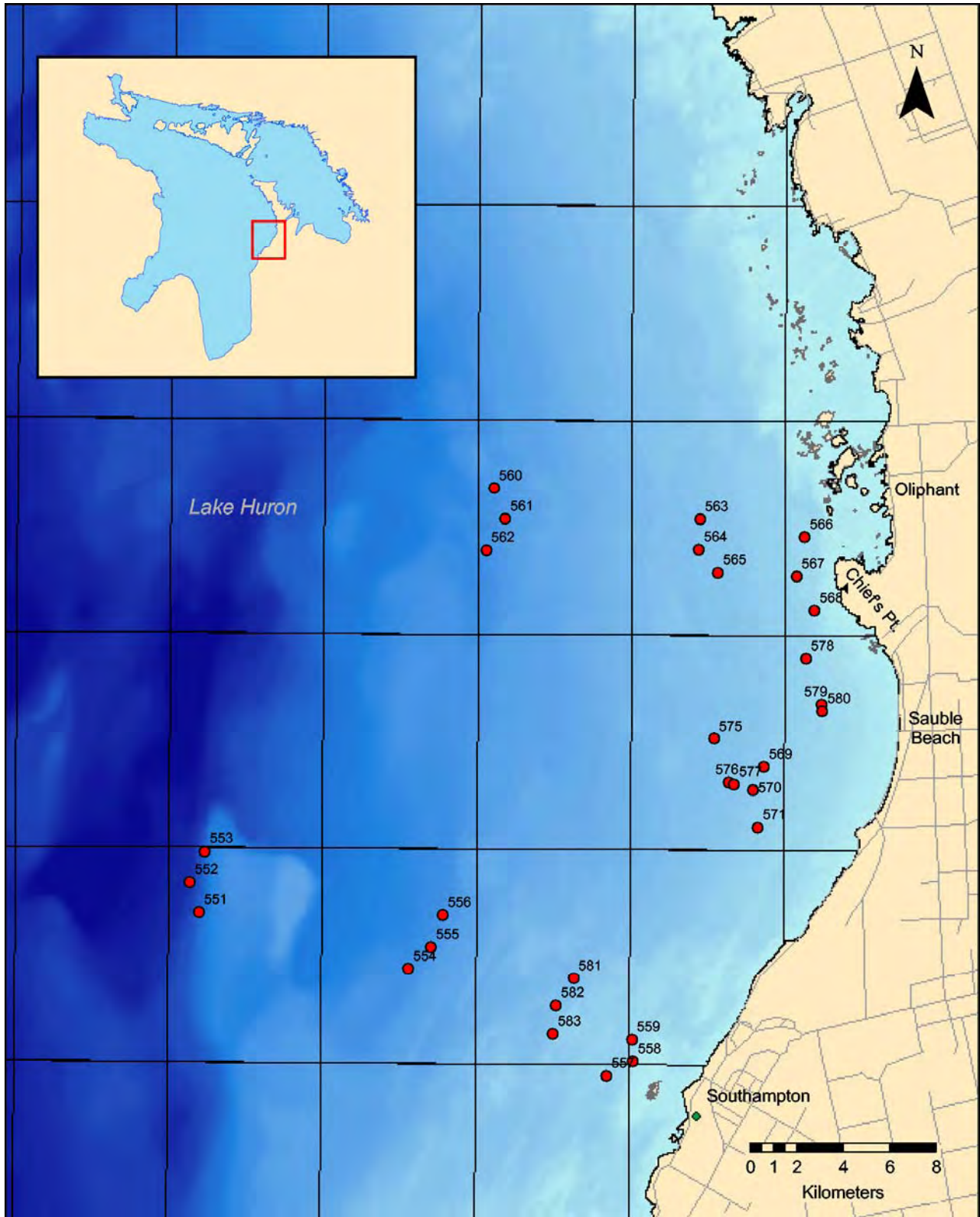


Figure 10. Offshore index sampling locations in central Lake Huron near Southampton targeting lake whitefish, deepwater chub and yellow perch. Nets were set in September 2004. (Project code LHA_IA04_005).

Table 6. Count of fish by species caught in each mesh size of experimental gill nets set in central Lake Huron, September 2004. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE. For the target species (deepwater chub, lake whitefish and yellow perch), all net sets targeted on that particular species were included in CPUE calculations, whether the target species was caught or not. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
alewife	34	36								70	8.75
burbot			2	4	3	3	1	1		14	2.00
chinook salmon		5	8	3	2	2			1	21	2.33
chub	4	29	89	15		1	1			139	15.44
lake chub	27	1								28	7.00
lake herring	69	32	20	1						122	7.63
lake trout		2	1	3	6	5	6	8	4	35	2.06
lake whitefish	73	67	5	2	3	5	3	7	2	167	12.67
longnose sucker	1	5	1	1	3	4	6	2		23	2.56
pink salmon							1			1	1.00
rainbow smelt	1		2		1	2		1		7	1.17
round goby	4	3								7	2.33
round whitefish		3	11	19	23	3				59	3.47
walleye							2	1	3	6	1.20
white sucker		1				2	4	1	2	10	2.00
yellow perch	13	19	15							47	5.22
Total	226	203	154	48	41	27	24	21	12	756	

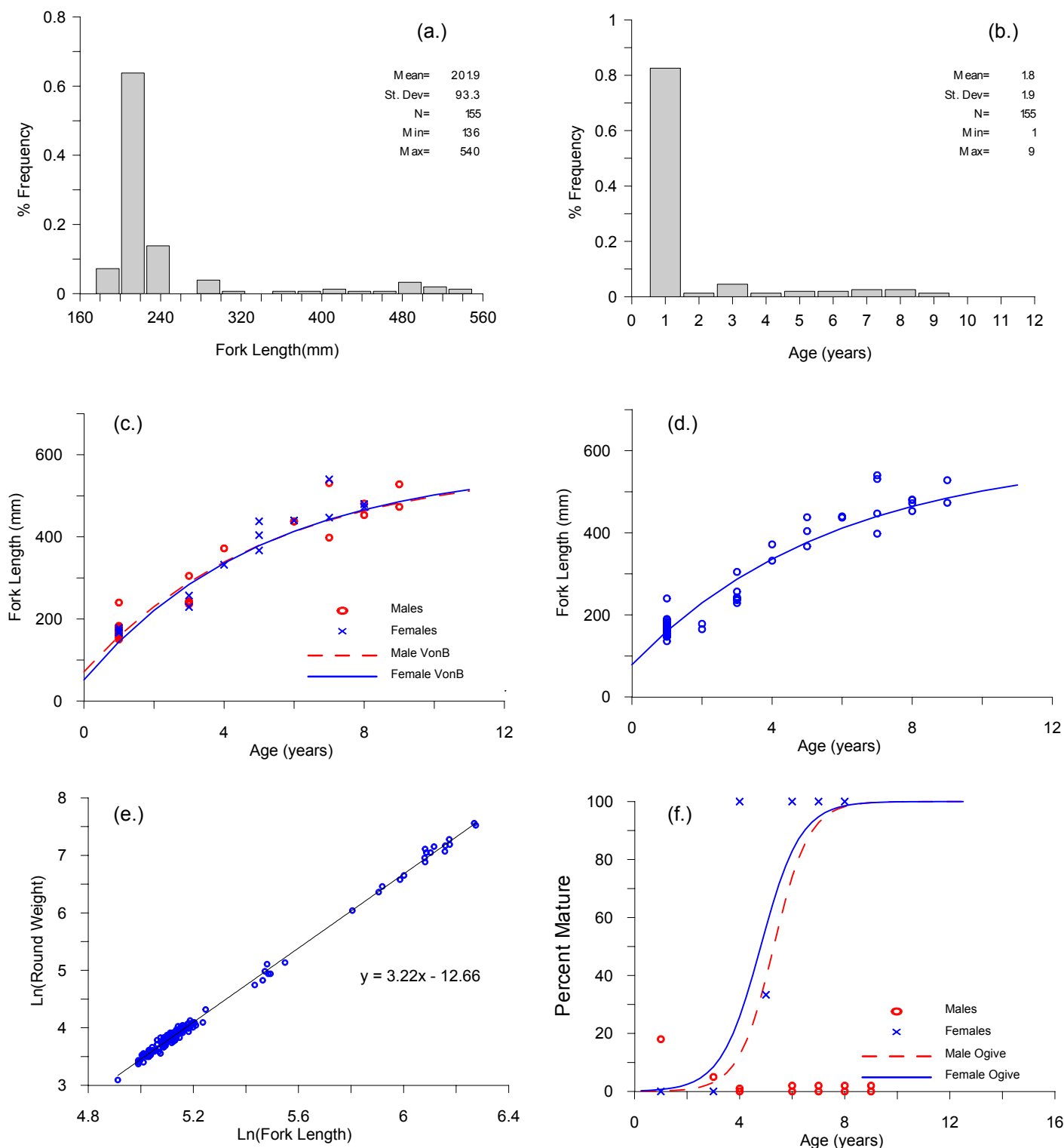


Figure 11. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake whitefish caught in the Fall 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=573.8$, $k=0.19$, $t_0=-0.7$ for males (dashed line), while parameter estimates for the females were $L_{inf}=576.6$, $k=0.195$, $t_0=-0.48$ (solid line). Maturity curves were estimated using logistic regression.

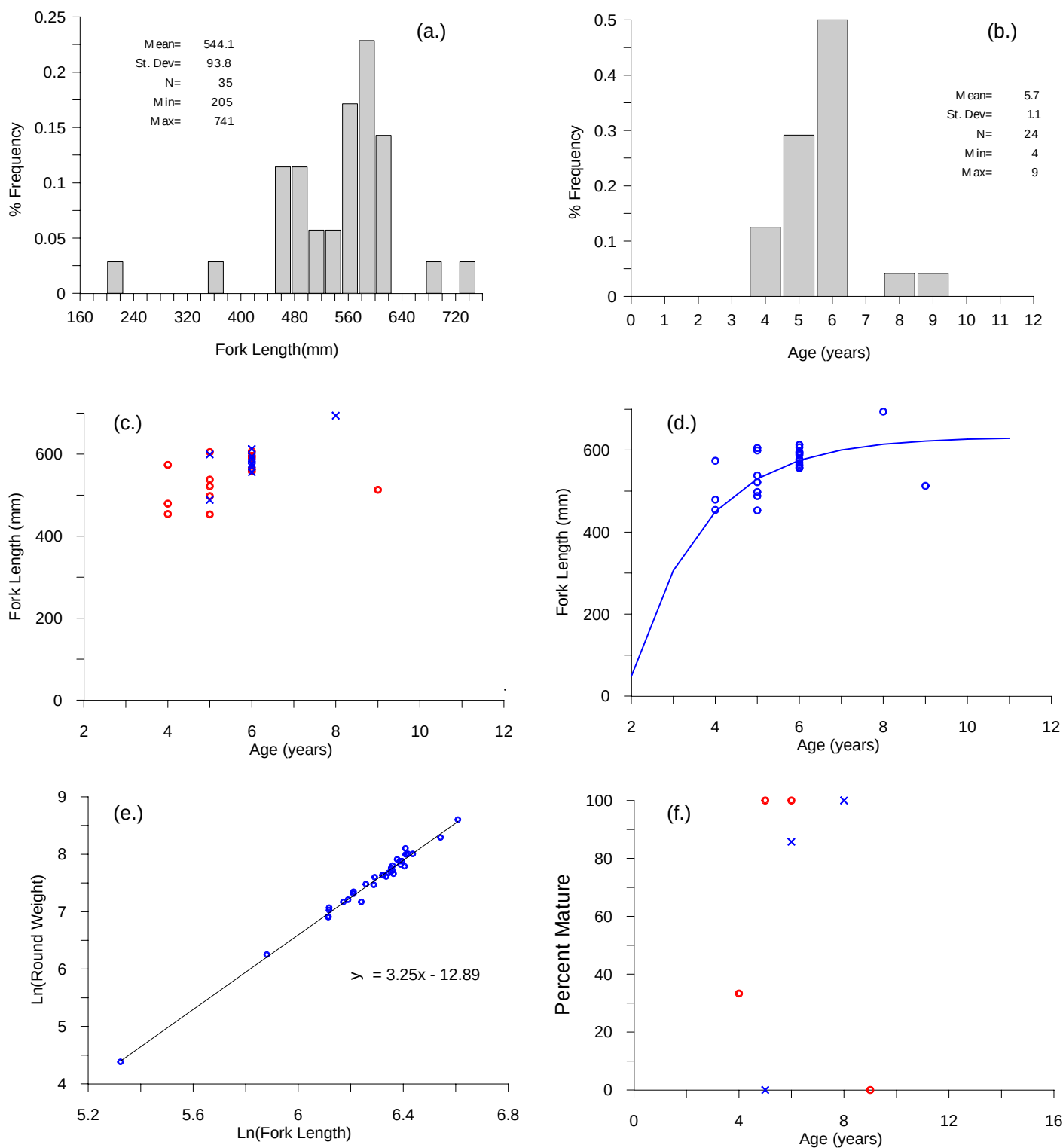


Figure 12. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake trout caught in the Fall 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). Fitted lines for fork length at age are Von Bertalanffy growth functions, while the maturity curve was estimated using logistic regression. Growth curve parameter estimates are $L_{\infty}=573.8$, $k=0.817$, $t_0=2.09$ for males (dashed line). There was insufficient data to generate growth or maturity curves for females.

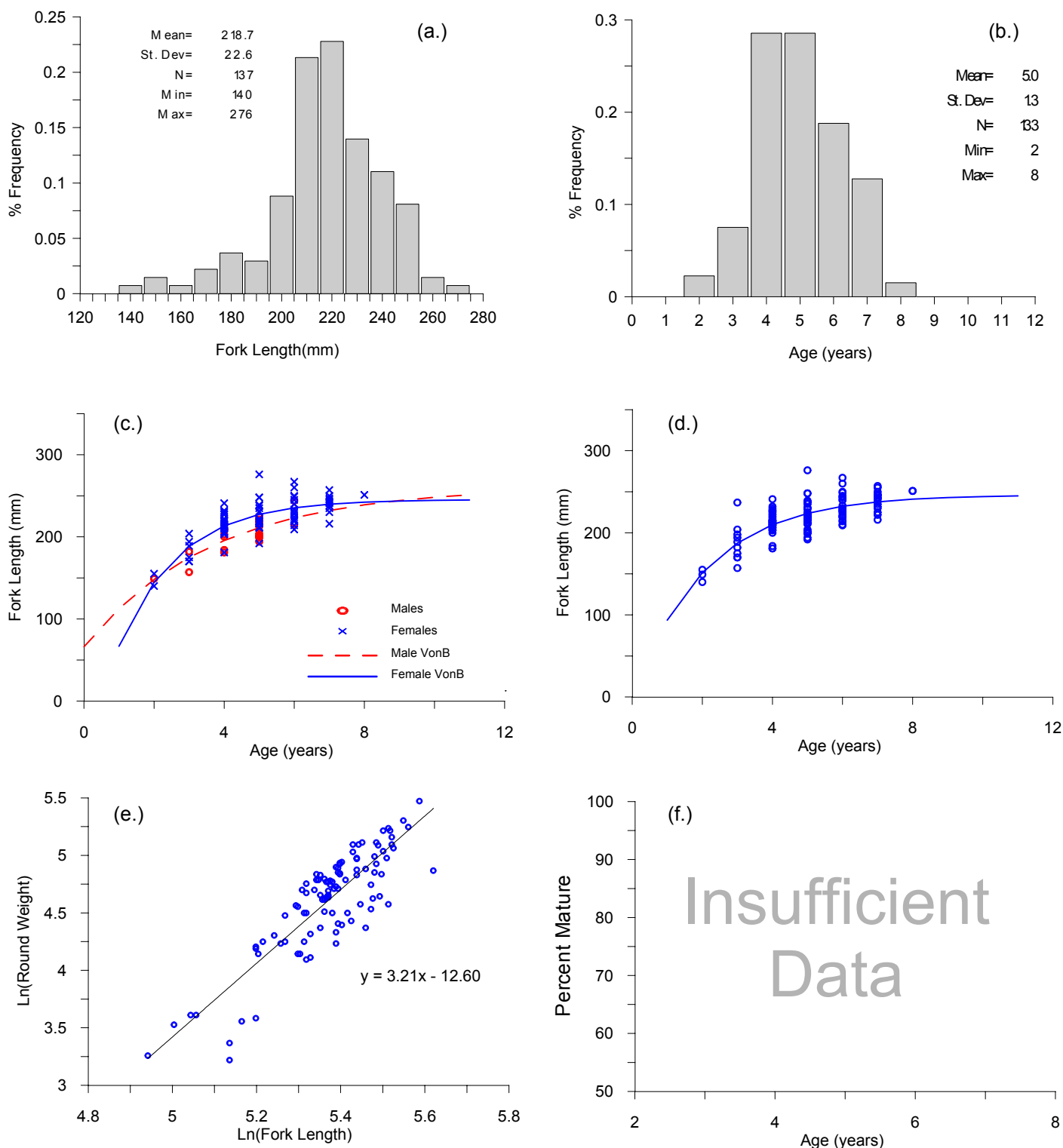


Figure 13. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of chub caught in the Fall 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). For the length at age plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=260.9$, $k=0.273$, $t_0=-1.07$ for males (dashed line), while parameter estimates for the females were $L_{inf}=245.5$, $k=0.573$, $t_0=0.45$ (solid line). There was not enough maturity data to generate curves for either sex.

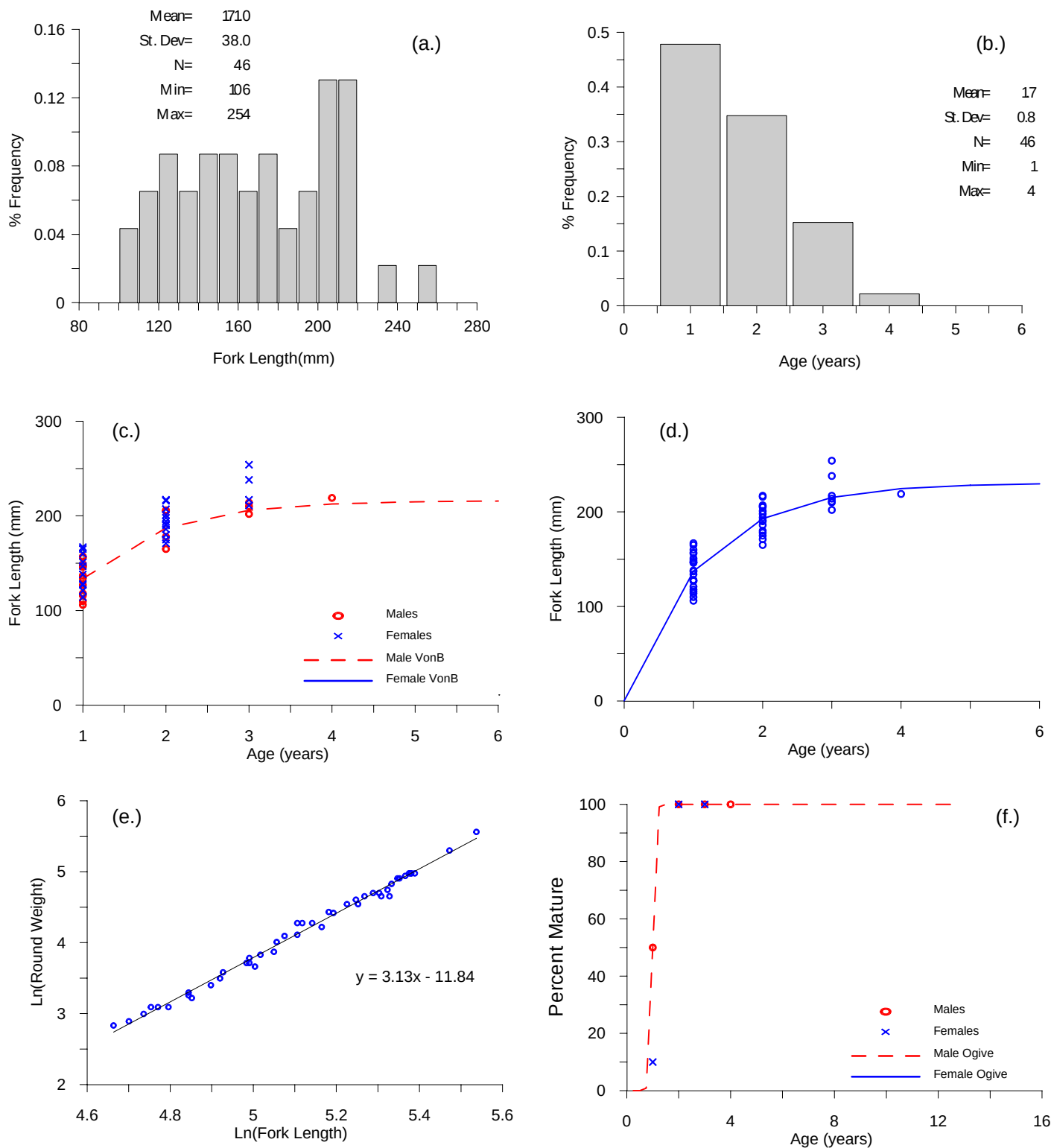


Figure 14. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of yellow perch caught in the Fall 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). Fitted lines for fork length at age are Von Bertalanffy growth functions, while the maturity curve was estimated using logistic regression. Growth curve parameter estimates are $L_{inf}=216.2$, $k=1.046$, $t_0=0.08$ for males (dashed line). There was insufficient data to generate growth or maturity curves for females.

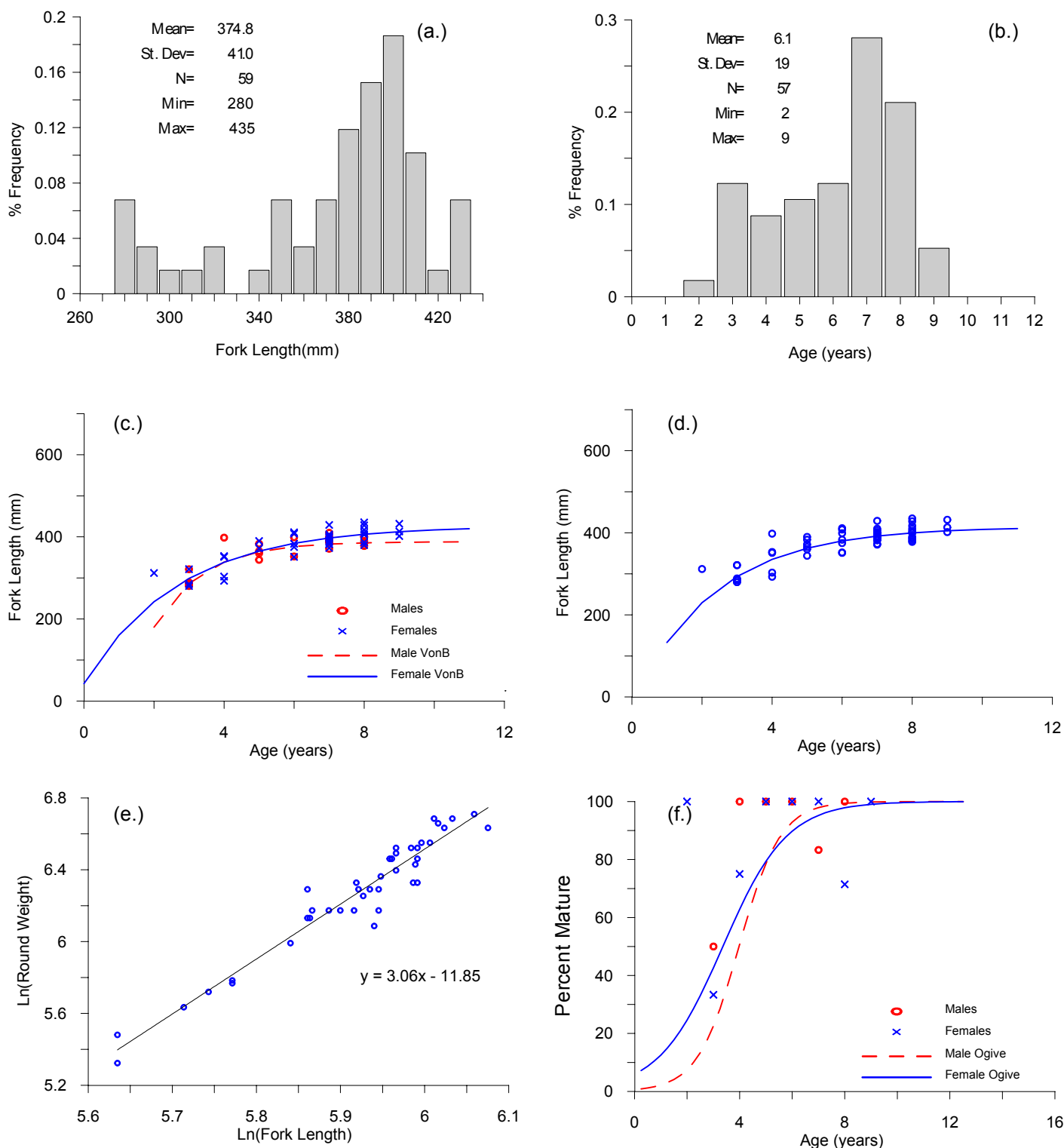


Figure 15. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of round whitefish caught in the Fall 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=388.1$, $k=0.717$, $t_0=1.13$ for males (dashed line), while parameter estimates for the females were $L_{inf}=426.8$, $k=0.367$, $t_0=-0.28$ (solid line). Maturity curves were estimated using logistic regression.

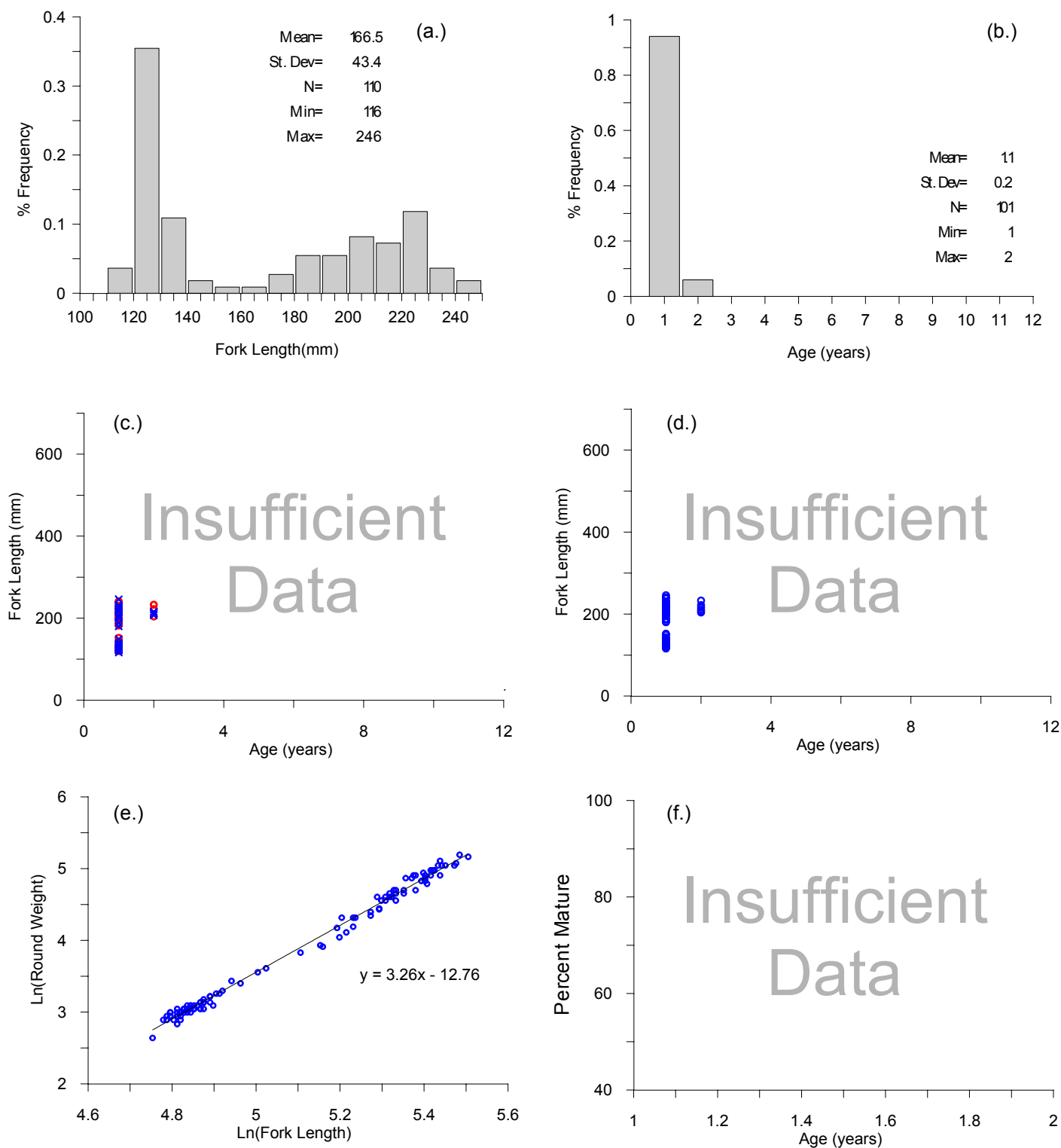


Figure 16. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake herring caught in the Fall 2004 Oliphant/Southampton OSIA project (LHA_IA04_005). There was insufficient age and maturity data to generate growth or maturity curves.

Table 7. Sample number, set date, latitude, longitude effort duration (hours) and average water depth of experimental gill nets gangs set in southern Lake Huron, June 2004.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
601	16-Jun-04	43° 39.18'	-081° 56.43'	GL32	16.91	64.51
602	16-Jun-04	43° 38.45'	-081° 56.09'	GL32	17.15	63.22
603	16-Jun-04	43° 36.94'	-081° 56.37'	GL32	17.56	62.30
604	17-Jun-04	43° 33.09'	-081° 57.68'	GL32	22.15	60.58
605	17-Jun-04	43° 32.59'	-081° 57.24'	GL32	22.36	58.78
606	17-Jun-04	43° 31.28'	-081° 57.17'	GL32	22.58	55.55
607	21-Jun-04	43° 24.83'	-081° 55.54'	GL32	20.58	29.18
608	21-Jun-04	43° 23.87'	-081° 55.33'	GL32	19.91	28.18
609	21-Jun-04	43° 22.97'	-081° 54.96'	GL32	19.23	25.35
610	22-Jun-04	43° 21.44'	-082° 02.57'	GL32	23.48	35.08
611	22-Jun-04	43° 21.23'	-082° 01.63'	GL32	23.75	34.91
612	22-Jun-04	43° 20.95'	-082° 00.51'	GL32	23.90	33.32
613	23-Jun-04	43° 18.43'	-081° 53.39'	GL32	21.10	17.60
614	23-Jun-04	43° 18.96'	-081° 53.00'	GL32	20.58	17.45
615	23-Jun-04	43° 19.06'	-081° 51.47'	GL32	20.03	15.88
616	24-Jun-04	43° 18.35'	-081° 57.85'	GL32	23.73	23.90
617	24-Jun-04	43° 18.28'	-081° 56.45'	GL32	23.15	21.20
618	24-Jun-04	43° 19.55'	-081° 55.75'	GL32	22.38	22.53
619	25-Jun-04	43° 17.36'	-081° 51.70'	GL32	22.61	12.86
620	25-Jun-04	43° 17.64'	-081° 50.76'	GL32	21.95	12.56
621	25-Jun-04	43° 18.32'	-081° 50.25'	GL32	21.25	12.67
622	26-Jun-04	43° 32.17'	-081° 45.08'	GL32	16.76	12.30
623	26-Jun-04	43° 32.95'	-081° 45.31'	GL32	16.05	12.36
624	26-Jun-04	43° 34.04'	-081° 45.00'	GL32	16.78	12.15
625	27-Jun-04	43° 35.66'	-081° 47.51'	GL32	22.98	17.24
626	27-Jun-04	43° 34.82'	-081° 47.88'	GL32	22.36	17.87
627	27-Jun-04	43° 34.02'	-081° 47.45'	GL32	21.70	17.05
628	28-Jun-04	43° 37.26'	-081° 52.27'	GL32	23.28	33.73
629	28-Jun-04	43° 36.69'	-081° 52.24'	GL32	22.61	35.44
630	28-Jun-04	43° 36.12'	-081° 52.67'	GL32	21.60	35.75

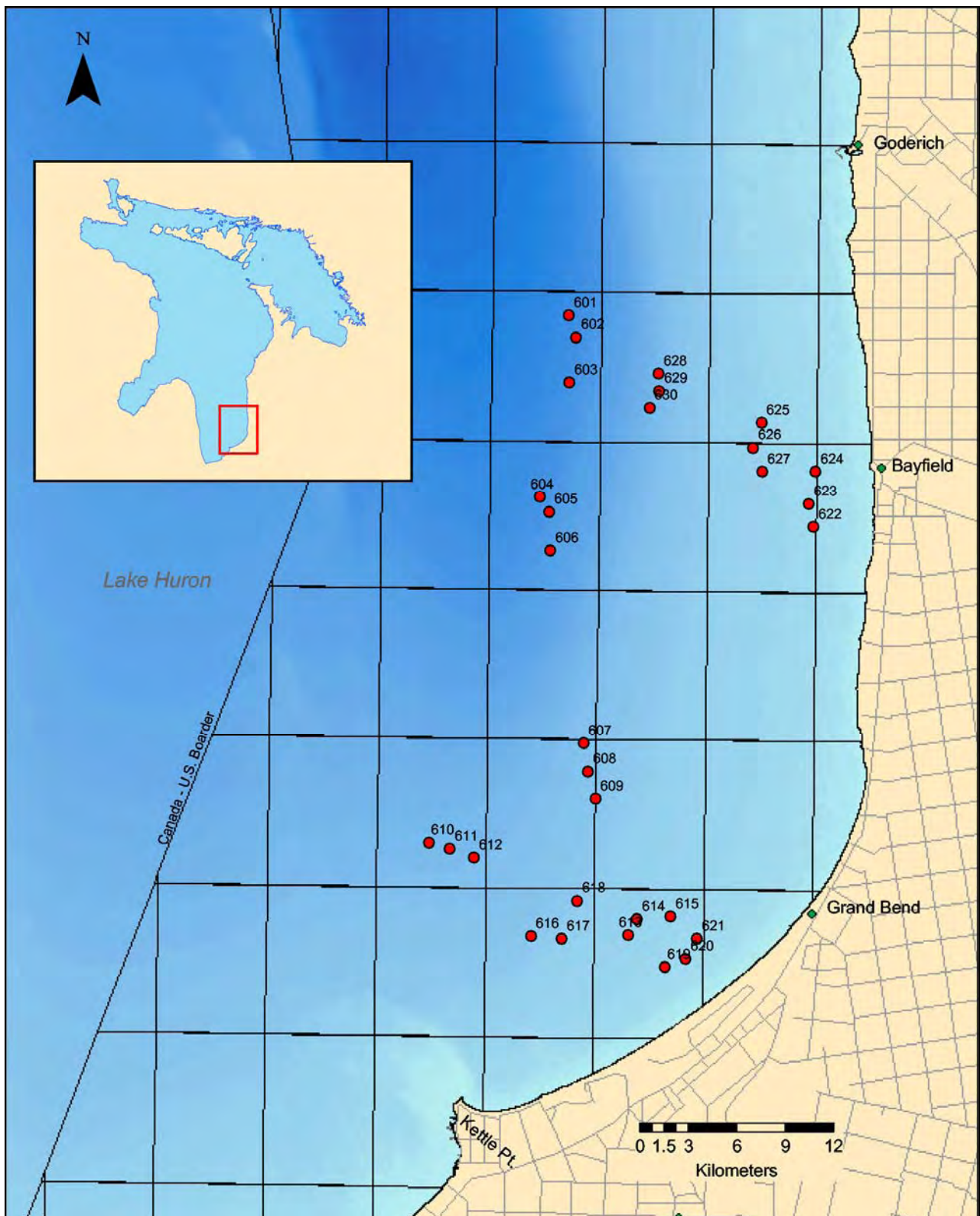


Figure 17. Offshore index sampling locations in southern Lake Huron near Bayfield targeting lake whitefish, deepwater chub and yellow perch. Nets were set in July 2004. (Project code LHA_IA04_006).

Table 8. Count of fish by species caught in each mesh size of experimental gill nets set in southern Lake Huron, July 2004. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE. For the target species (deepwater chub, lake whitefish and yellow perch), all net sets targeted on that particular species were included in CPUE calculations, whether the target species was caught or not. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
alewife		3								3	1.00
burbot					1					1	1.00
chinook salmon				1	1					2	1.00
chub		1		1						2	0.33
coho salmon				1						1	1.00
lake trout				3	4	3	4	3	1	18	1.64
lake whitefish	26	7	25	13	8	11	23	11	2	126	7.58
longnose sucker		2	8	6	2			1		19	1.90
rainbow smelt		1	2		1	1				5	1.25
round goby	3				1					4	2.00
walleye							2	2		4	1.33
white sucker				2	7	11	2	1		23	2.56
yellow perch	457	657	461	29	6	5	4			1619	95.92
Total	486	671	496	56	31	31	35	18	3	1827	

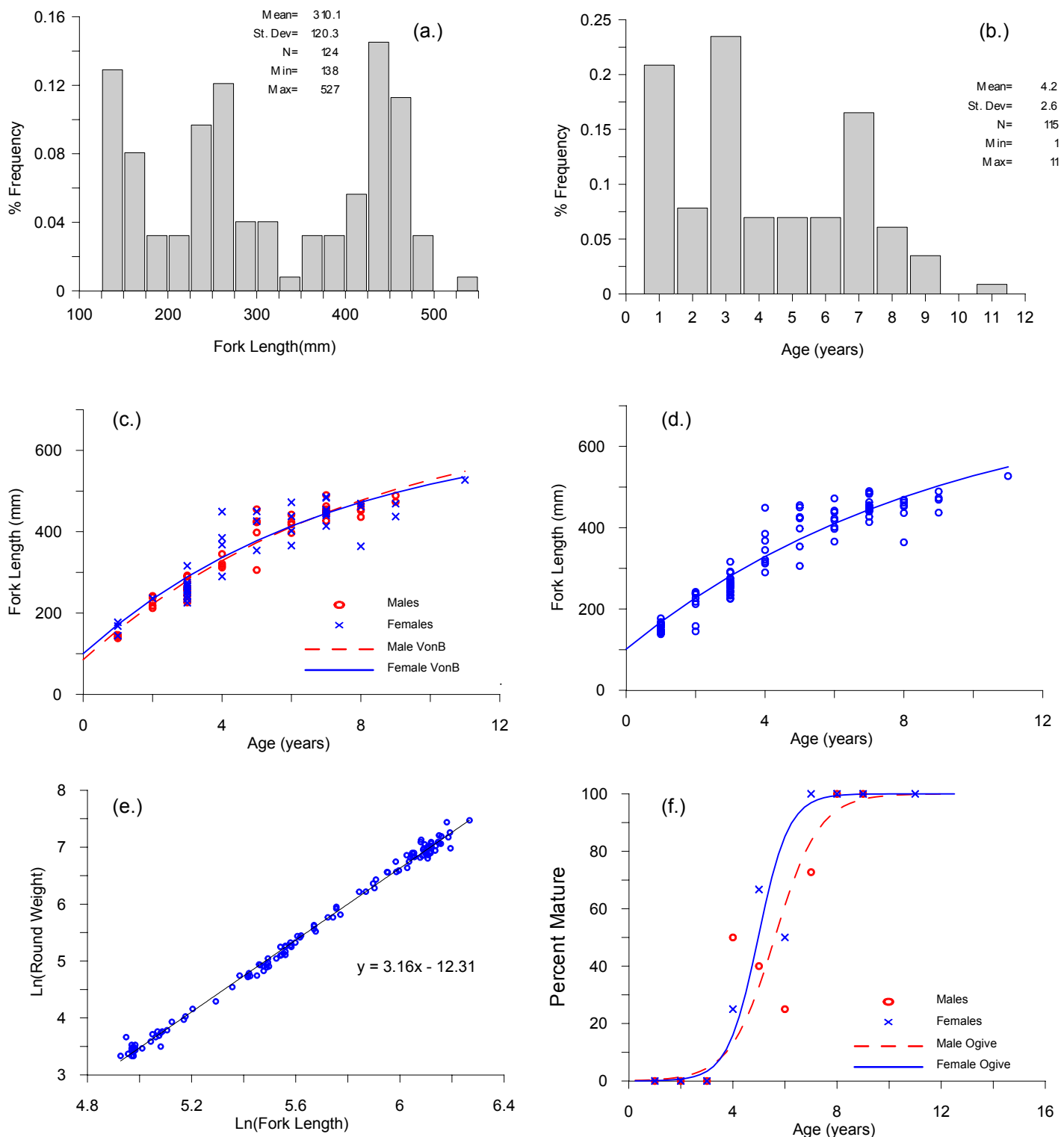


Figure 18. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake whitefish caught in the Spring 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=707.6$, $k=0.124$, $t_0=-1.04$ for males (dashed line), while parameter estimates for the females were $L_{inf}=655.6$, $k=0.139$, $t_0=-1.19$ (solid line). Maturity curves were estimated using logistic regression.

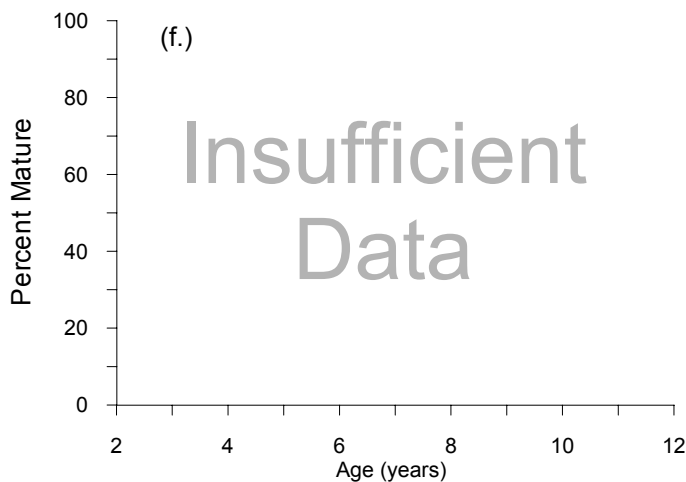
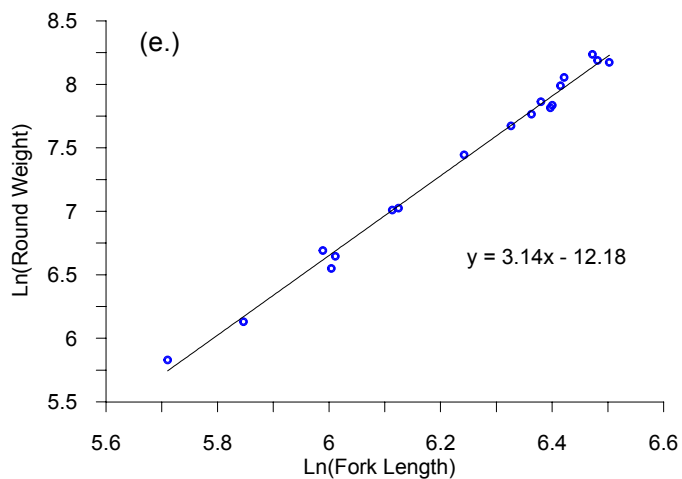
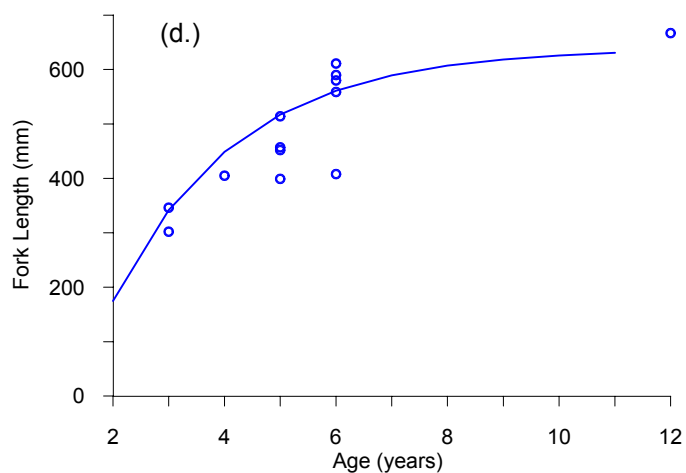
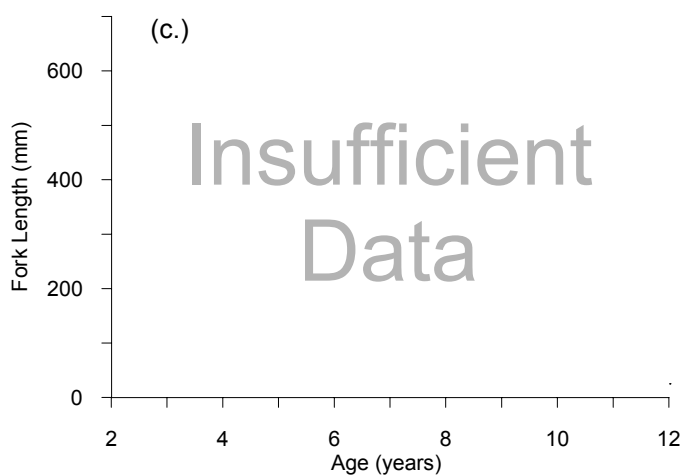
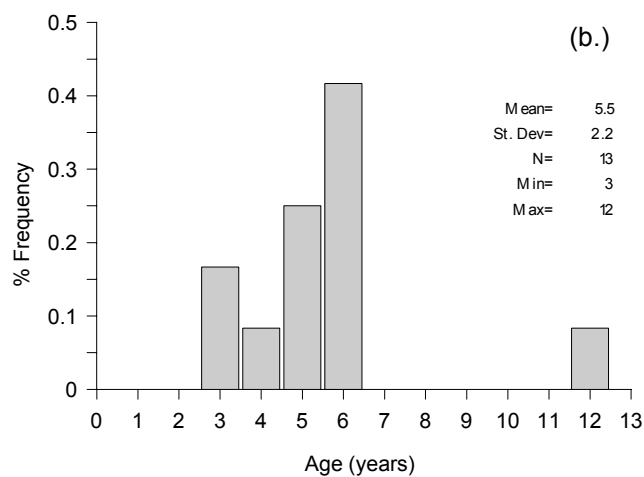
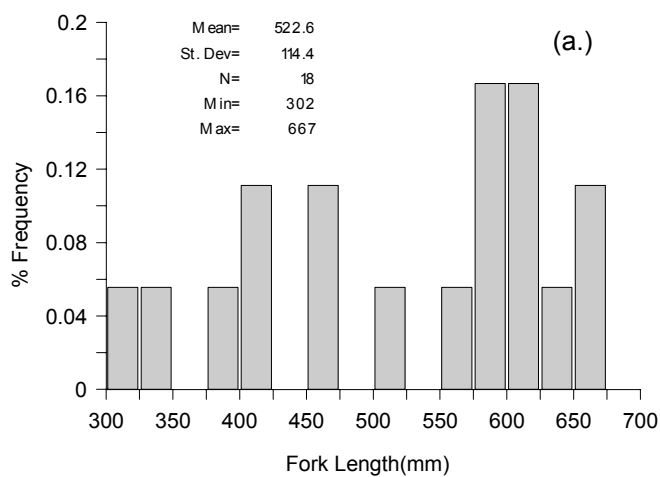


Figure 19. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake trout caught in the Spring 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). There was insufficient age and maturity data to generate growth or maturity curves.

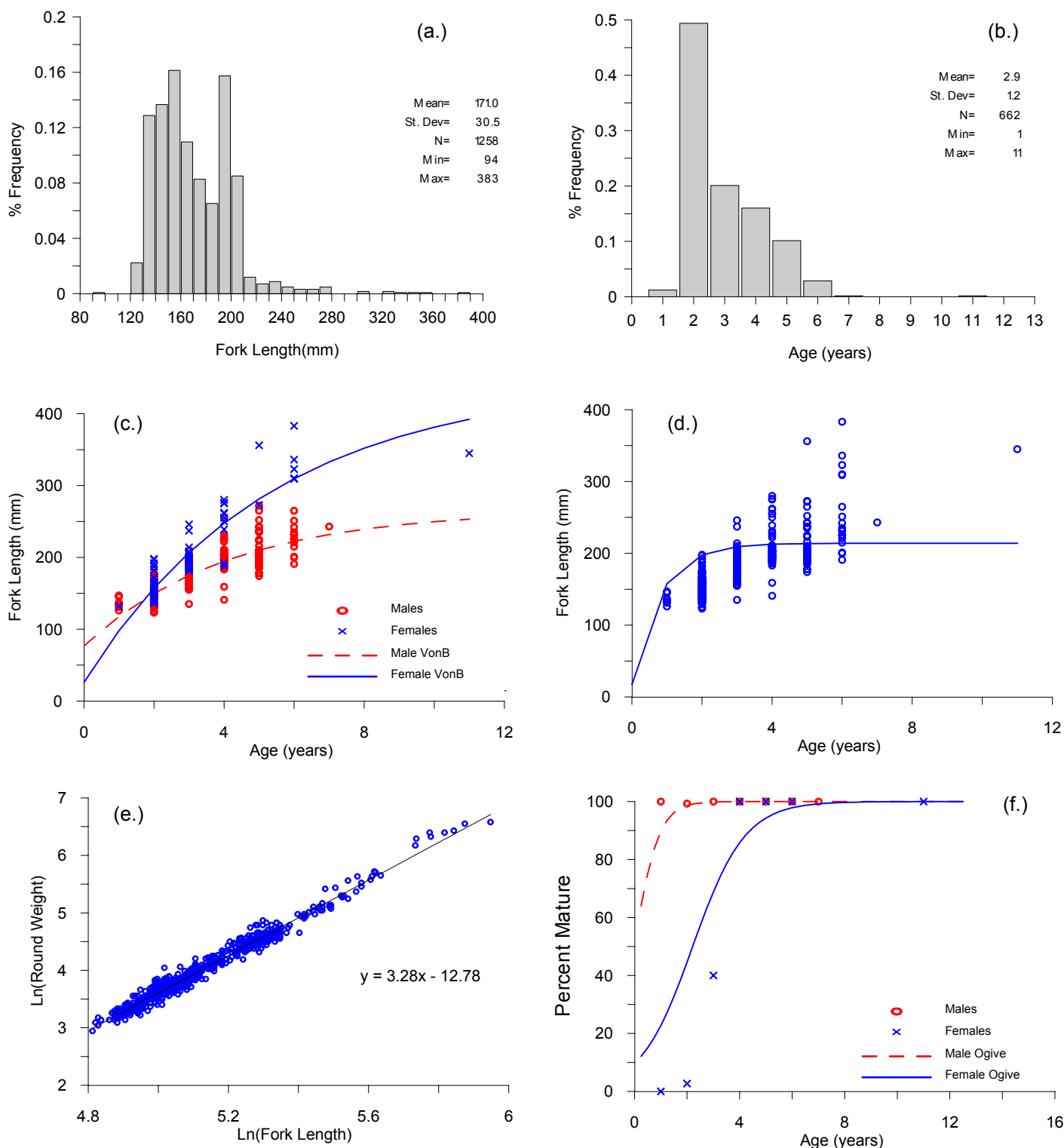


Figure 20. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of yellow perch caught in the Spring 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{\infty}=266.2$, $k=0.244$, $t_0=-1.39$ for males (dashed line), while parameter estimates for the females were $L_{\infty}=445.5$, $k=0.188$, $t_0=-0.32$ (solid line). Maturity curves were estimated using logistic regression.

Table 9. Sample number, set date, latitude, longitude, effort duration (hours) and average water depth of experimental gill nets gangs set in southern Lake Huron, September 2004.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
651	16-Sep-04	43° 17.83'	-081° 53.18'	GL32	15.48	16.34
652	16-Sep-04	43° 18.45'	-081° 52.45'	GL32	14.85	15.77
653	16-Sep-04	43° 18.69'	-081° 51.41'	GL32	14.25	15.07
654	17-Sep-04	43° 16.42'	-081° 52.79'	GL32	22.66	12.19
655	17-Sep-04	43° 16.70'	-081° 52.12'	GL32	21.98	12.62
656	17-Sep-04	43° 17.25'	-081° 51.70'	GL32	21.36	12.50
657	18-Sep-04	43° 17.82'	-081° 59.10'	GL32	22.66	24.67
658	18-Sep-04	43° 18.39'	-081° 58.24'	GL32	21.65	24.52
659	18-Sep-04	43° 18.78'	-081° 57.20'	GL32	20.91	24.28
660	19-Sep-04	43° 21.66'	-082° 02.97'	GL32	23.01	35.65
661	19-Sep-04	43° 21.91'	-082° 02.18'	GL32	22.36	35.62
662	19-Sep-04	43° 21.70'	-082° 01.33'	GL32	22.55	35.65
663	20-Sep-04	43° 24.51'	-081° 55.96'	GL32	22.53	29.51
664	20-Sep-04	43° 23.73'	-081° 55.63'	GL32	21.73	28.38
665	20-Sep-04	43° 22.92'	-081° 55.96'	GL32	21.08	27.45
666	21-Sep-04	43° 32.82'	-081° 50.81'	GL32	22.28	23.13
667	21-Sep-04	43° 33.43'	-081° 50.76'	GL32	21.60	24.10
668	21-Sep-04	43° 34.50'	-081° 50.89'	GL32	20.70	24.97
669	27-Sep-04	43° 34.10'	-081° 56.78'	GL32	45.00	57.43
670	27-Sep-04	43° 33.44'	-081° 56.59'	GL32	44.18	56.66
671	27-Sep-04	43° 32.80'	-081° 57.13'	GL32	43.33	56.52
672	29-Sep-04	43° 34.72'	-081° 45.51'	GL32	21.35	12.12
673	29-Sep-04	43° 33.98'	-081° 45.33'	GL32	20.41	12.20
674	29-Sep-04	43° 33.12'	-081° 45.27'	GL32	24.20	11.88
675	30-Sep-04	43° 34.85'	-081° 47.12'	GL32	22.76	16.82
676	30-Sep-04	43° 34.21'	-081° 47.27'	GL32	23.01	16.93
677	30-Sep-04	43° 33.42'	-081° 46.57'	GL32	23.25	15.51

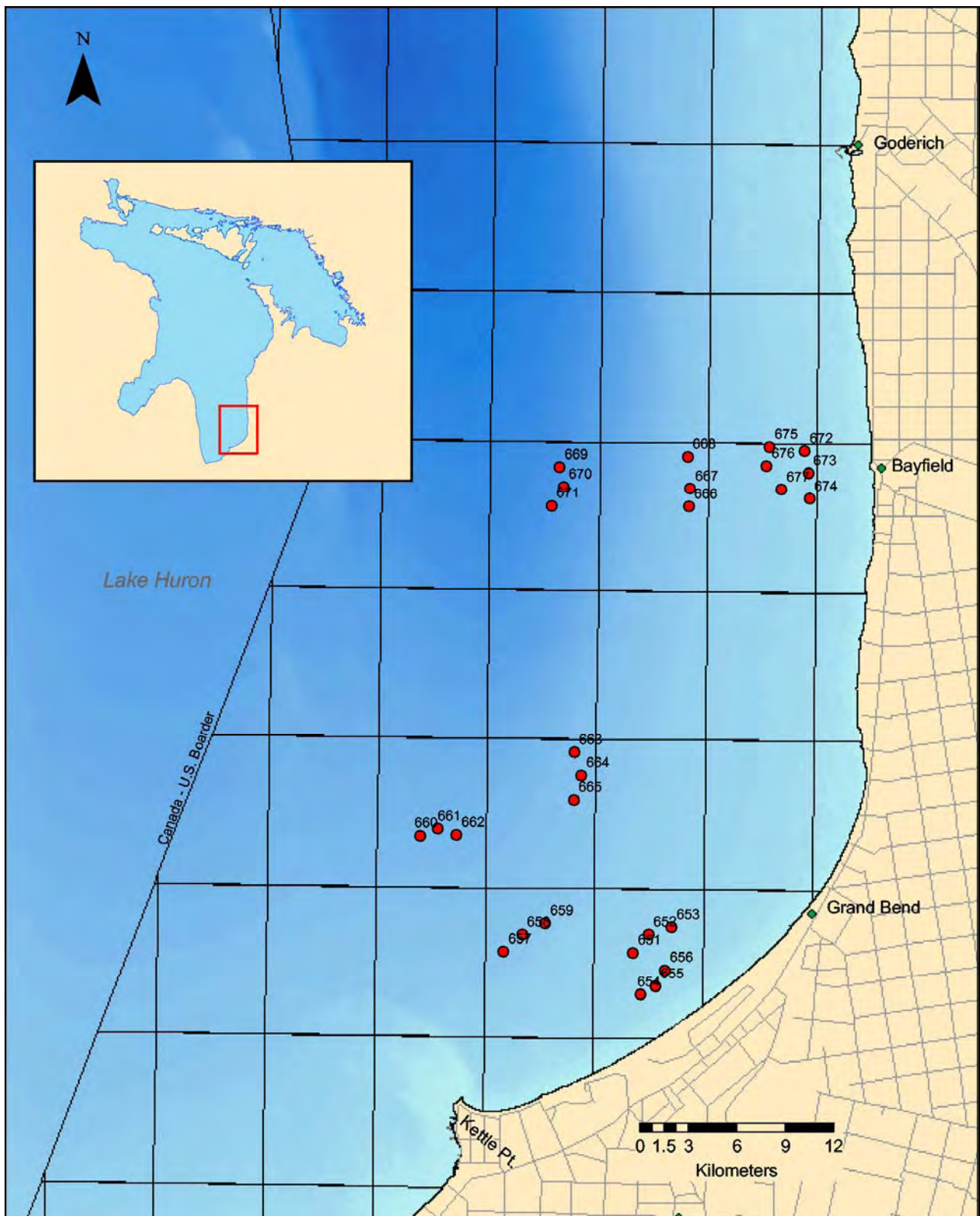


Figure 21. Offshore index sampling locations in central Lake Huron near Bayfield targeting lake whitefish, deepwater chub and yellow perch. Nets were set in late September and early October 2004. (Project code LHA_IA04_006).

Table 10. Count of fish by species caught in each mesh size of experimental gill nets set in southern Lake Huron, September and October 2004. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE. For the target species (deepwater chub, lake whitefish and yellow perch), all net sets targeted on that particular species were included in CPUE calculations, whether the target species was caught or not. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
alewife	14	30	5	1						50	10.00
Atlantic salmon									1	1	1.00
brown trout						1				1	1.00
burbot							1			1	1.00
channel catfish								1		1	1.00
chinook salmon		2	11	8	1	2	1			25	4.17
common carp						1				1	1.00
gizzard shad								1	1	2	1.00
lake chub	3									3	3.00
lake herring	39	3	1	1			1			45	3.00
lake trout				3	8	10	13	15	11	60	2.85
lake whitefish	43	112	33	19	3	3	3	3	1	220	10.53
longnose sucker	5	15	25	34	8	3	1			91	22.75
rainbow smelt	2	9	6	1	2	3			1	24	6.00
round goby	4									4	1.00
sea lamprey						1				1	1.00
spottail shiner	1									1	1.00
walleye							2	2	1	5	1.25
white sucker	1	13	34	52	47	17	2	2		168	28.00
yellow perch	429	70	124	17	4	2	1	4		651	54.25
Total	541	254	239	136	73	43	25	28	16	1355	

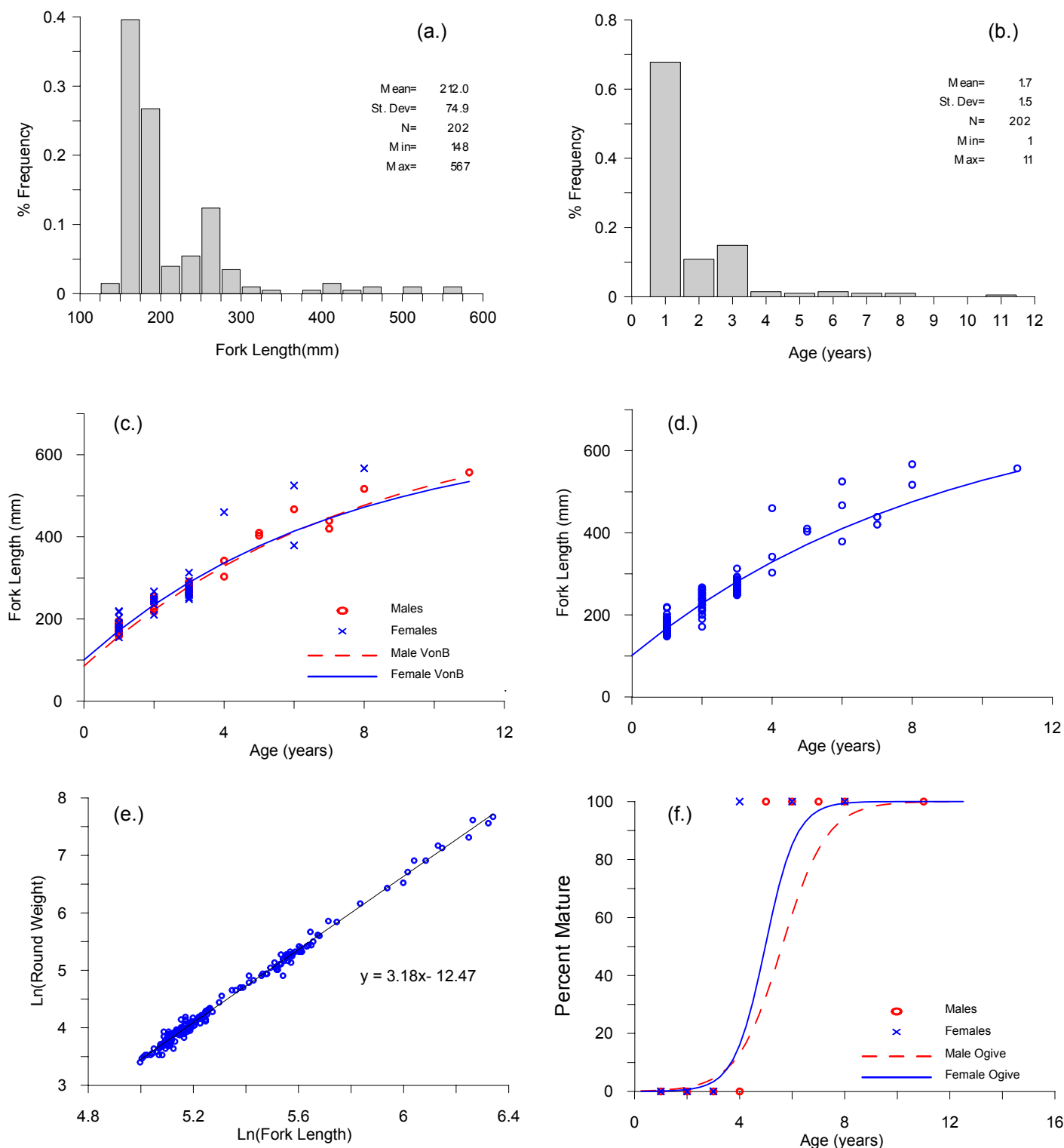


Figure 22. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake whitefish caught in the Fall 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=707.6$, $k=0.124$, $t_0=-1.04$ for males (dashed line), while parameter estimates for the females were $L_{inf}=655.6$, $k=0.139$, $t_0=-1.19$ (solid line). Maturity curves were estimated using logistic regression.

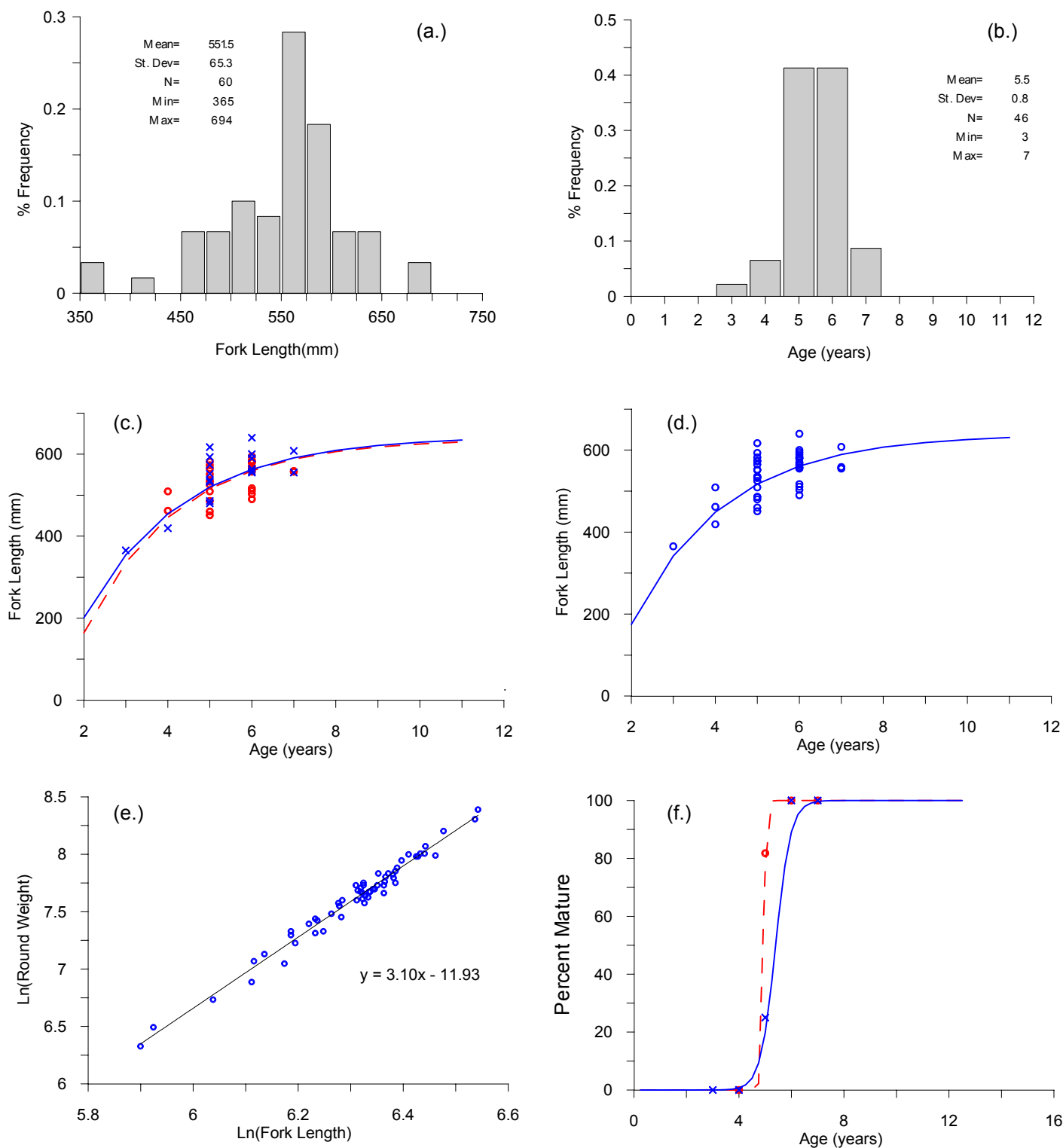


Figure 23. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake trout caught in the Fall 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=637.7$, $k=0.451$, $t_0=1.34$ for males (dashed line), while parameter estimates for the females were $L_{inf}=643.9$, $k=0.425$, $t_0=1.12$ (solid line). Maturity curves were estimated using logistic regression.

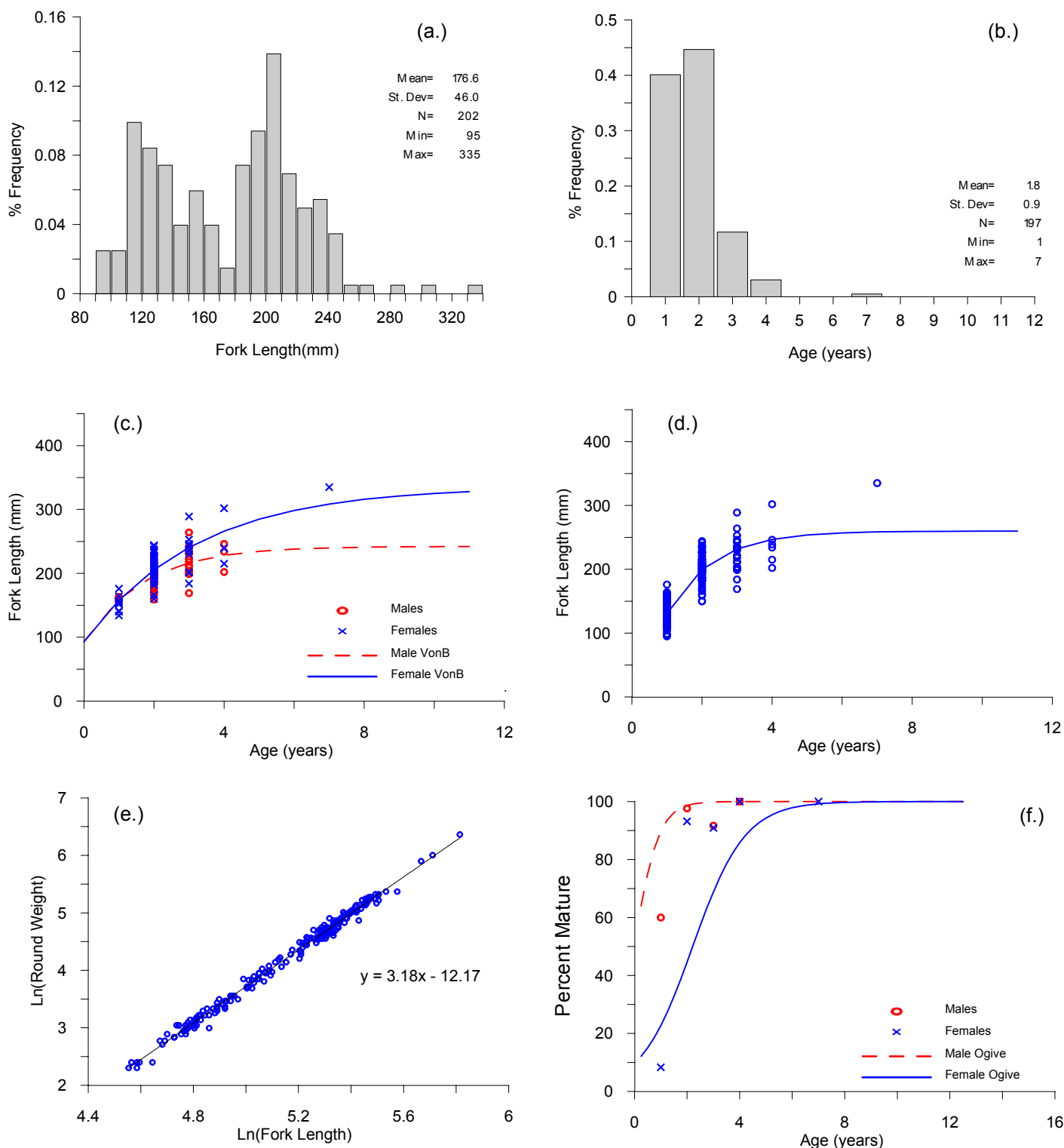


Figure 24. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of yellow perch caught in the Fall 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=242.3$, $k=0.589$, $t_0=-0.82$ for males (dashed line), while parameter estimates for the females were $L_{inf}=335.8$, $k=0.313$, $t_0=-1.03$ (solid line). Maturity curves were estimated using logistic regression.

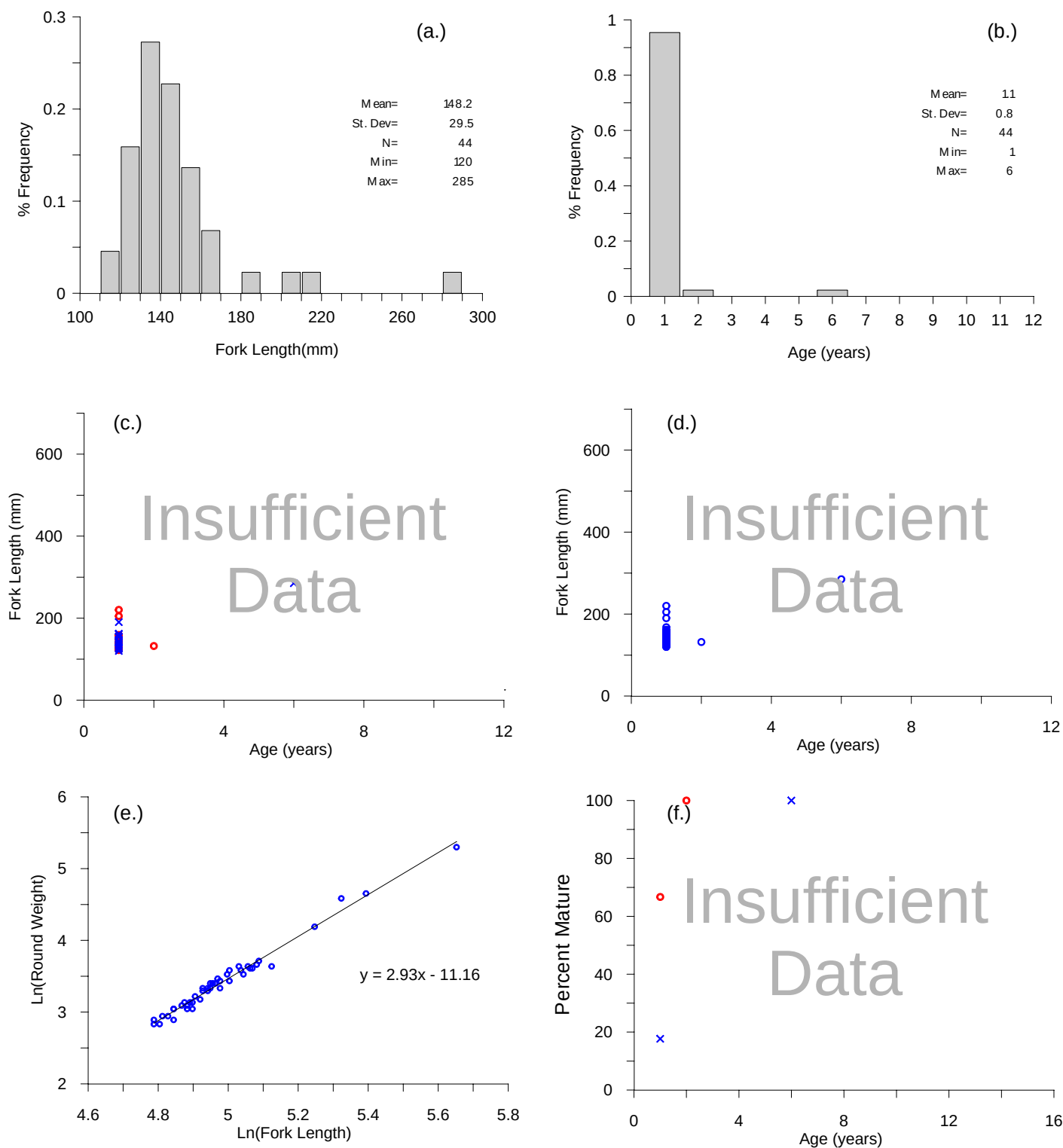


Figure 25. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake herring caught in the Fall 2004 Grand Bend/Bayfield OSIA project (LHA_IA04_006). There was not enough age data to generate growth curves for either sex or a maturity curve for males. The maturity curve for females was estimated using logistic regression.

Table 11. Sample number, set date, latitude, longitude, effort duration (hours) and average water depth of experimental gill nets gangs set in the North Channel, July 2004.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
701	07-Jul-04	46° 01.56'	-082° 11.04'	GL32	23.88	16.48
702	07-Jul-04	46° 01.54'	-082° 11.10'	GL32	23.33	17.7
703	07-Jul-04	46° 01.13'	-082° 10.92'	GL32	22.83	16.59
704	08-Jul-04	46° 02.07'	-082° 19.70'	GL32	24.50	15.16
705	08-Jul-04	46° 02.58'	-082° 19.11'	GL32	24.05	15.3
706	08-Jul-04	46° 03.05'	-082° 18.74'	GL32	23.50	15.3
707	09-Jul-04	45° 58.56'	-082° 16.70'	GL32	21.15	8.13
708	09-Jul-04	45° 58.05'	-082° 16.91'	GL32	20.53	8.68
709	09-Jul-04	45° 57.42'	-082° 16.87'	GL32	19.95	7.22
710	10-Jul-04	45° 55.93'	-082° 05.84'	GL32	22.86	11.05
711	10-Jul-04	45° 56.16'	-082° 05.79'	GL32	22.40	10.63
712	10-Jul-04	45° 56.80'	-082° 05.36'	GL32	21.91	9.07
713	11-Jul-04	45° 59.29'	-082° 11.76'	GL32	22.20	9.88
714	11-Jul-04	45° 59.96'	-082° 11.59'	GL32	22.33	9.11
715	11-Jul-04	46° 00.17'	-082° 11.53'	GL32	22.50	11.22
716	12-Jul-04	46° 01.99'	-082° 00.12'	GL32	20.93	12.12
717	12-Jul-04	46° 02.21'	-082° 00.97'	GL32	20.28	6.54
718	12-Jul-04	46° 02.44'	-082° 00.65'	GL32	19.66	11.67

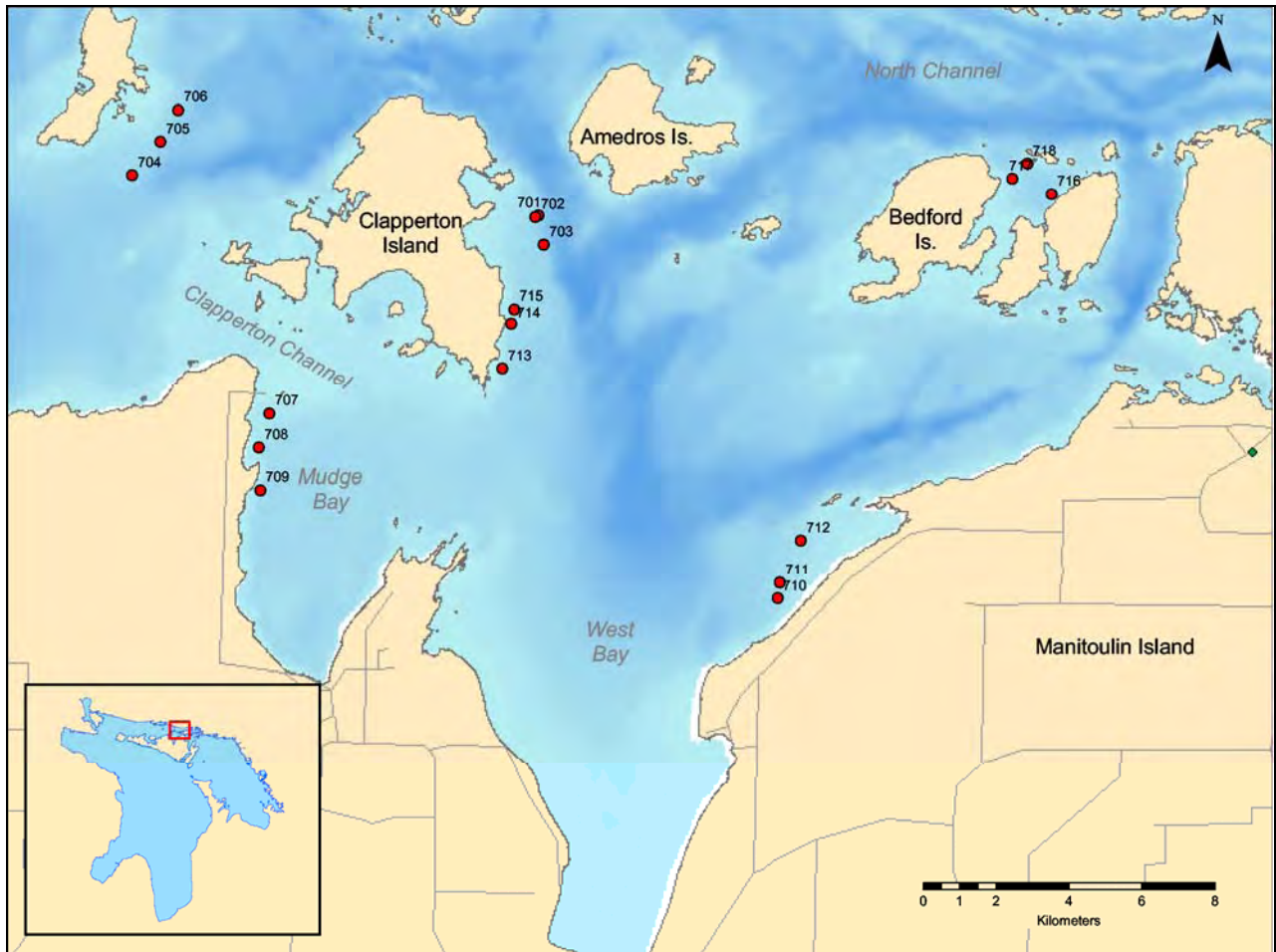


Figure 26. Offshore index sampling locations in the North channel near Clapperton Island targeting yellow perch. Nets were set in July 2004. (Project code LHA_IA04_007).

Table 12. Count of fish by species caught in each mesh size of experimental gill nets set in the North Channel, near Clapperton Island, July 2004. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE. For the target species (deepwater chub, lake whitefish and yellow perch), all net sets targeted on that particular species were included in CPUE calculations, whether the target species was caught or not. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
alewife	1									1	1.00
burbot				1	1	1	2	3	1	9	1.50
chinook salmon				1	1					2	2.00
lake chub	14									14	4.67
lake herring	2	10	21	44	35	10	1		1	124	8.86
lake trout					1					1	1.00
lake whitefish	4	7	25	22	16	14	8	5	3	104	6.93
longnose sucker				1	5	1	5			12	3.00
rainbow smelt	2		6	6	1	2				17	2.83
rainbow trout				1						1	1.00
rock bass			1	5						6	1.20
round whitefish		1	4	8	5	2	3	1		24	2.67
smallmouth bass			2							2	2.00
trout-perch	24									24	3.43
white sucker	1	9	25	23	34	60	97	83	42	374	24.93
yellow perch	58	83	16	2		1				160	8.89
Total	106	110	100	114	99	91	116	92	47	875	

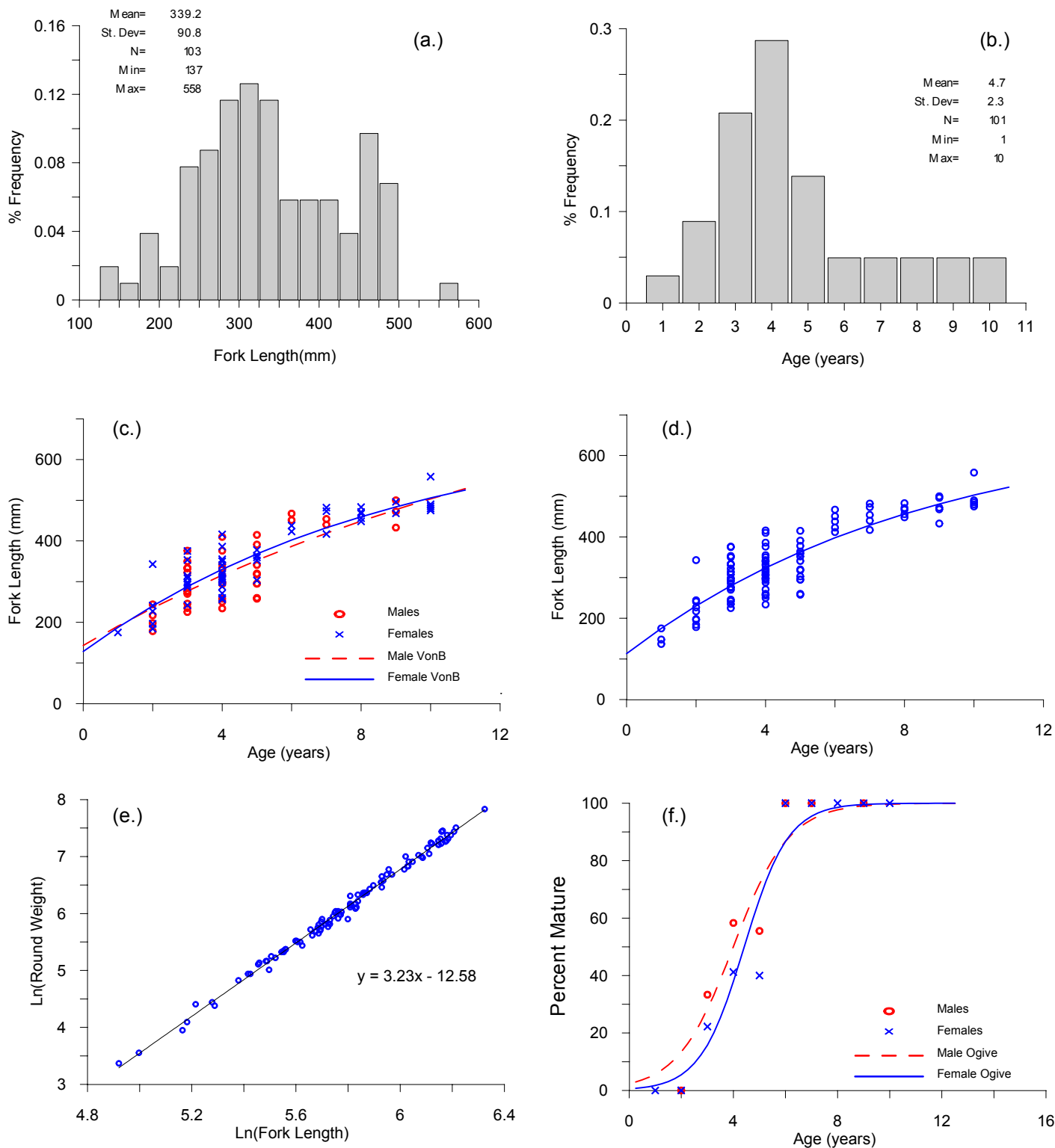


Figure 27. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake whitefish caught in the 2004 Clapperton Island OSIA project (LHA_IA04_007). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=897.9$, $k=0.065$, $t_0=-2.67$ for males (dashed line), while parameter estimates for the females were $L_{inf}=689.2$, $k=0.112$, $t_0=-1.84$ (solid line). Maturity curves were estimated using logistic regression.

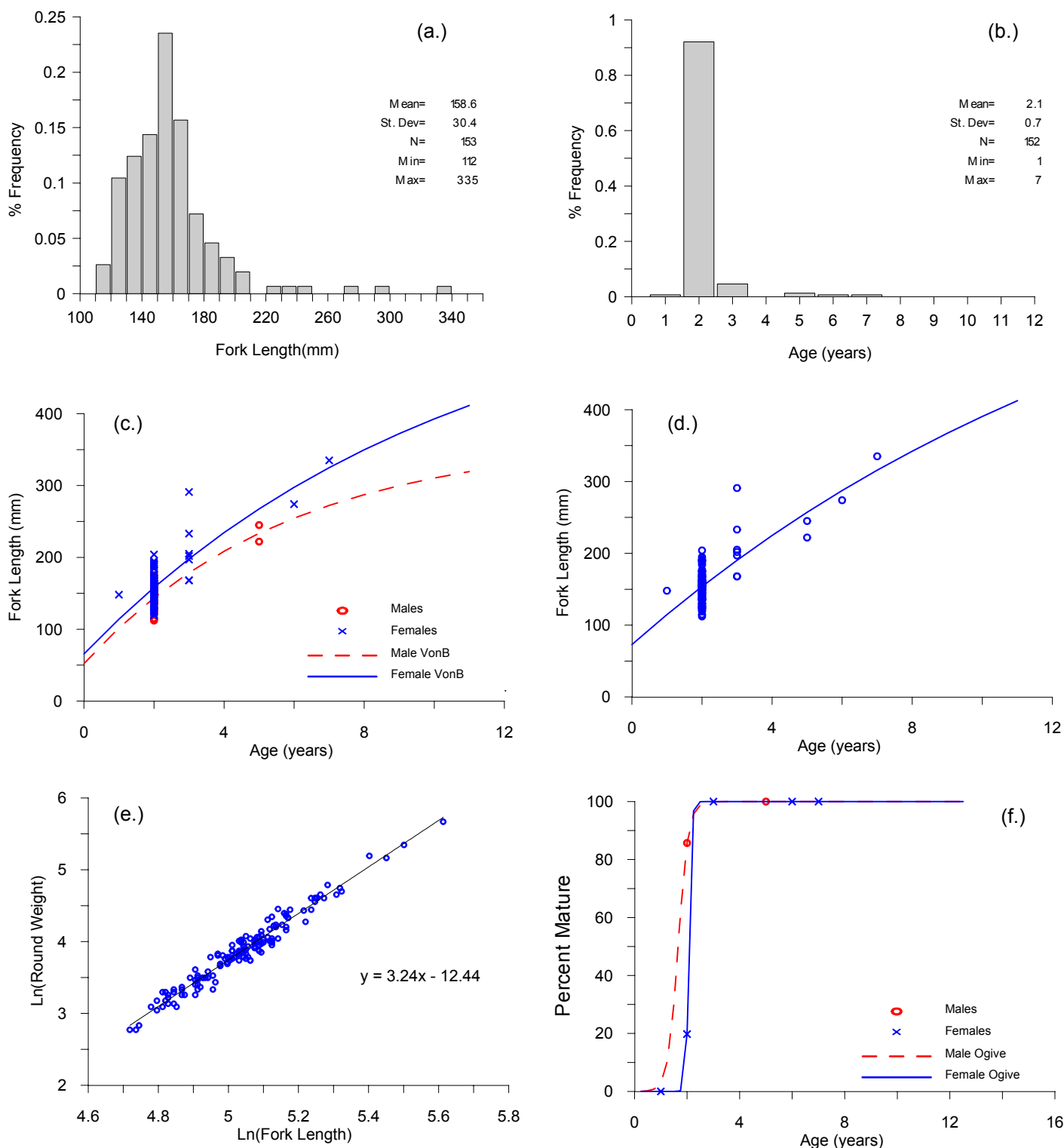


Figure 28. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of yellow perch caught in the 2004 Clapperton Island OSIA project (LHA_IA04_007). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{inf}=367.1$, $k=0.172$, $t_0=-0.89$ for males (dashed line), while parameter estimates for the females were $L_{inf}=597.5$, $k=0.096$, $t_0=-1.21$ (solid line). Maturity curves were estimated using logistic regression.

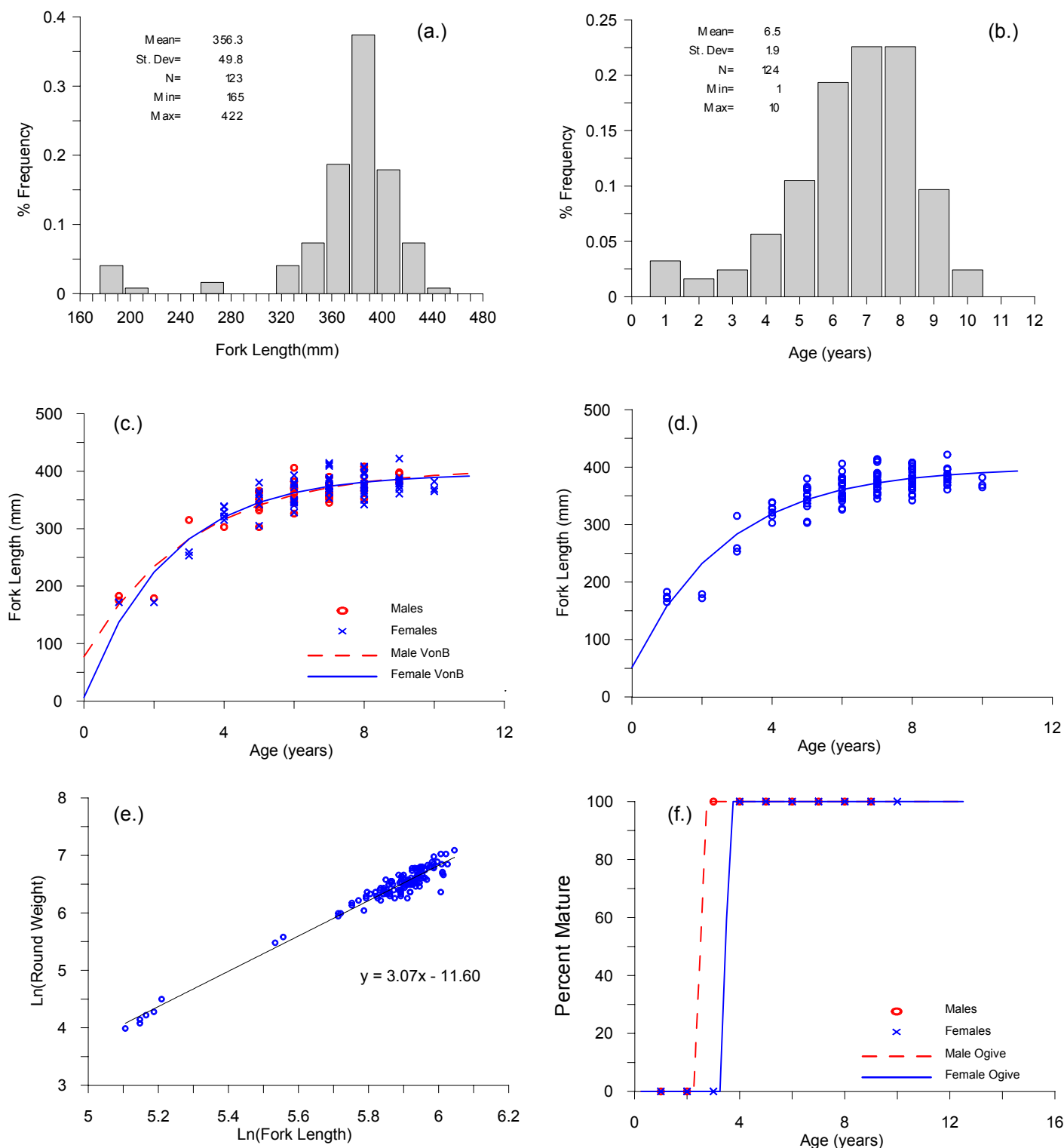


Figure 29. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of lake herring caught in the 2004 Clapperton Island OSIA project (LHA_IA04_007). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $\text{Linf}=405.1$, $k=0.326$, $t_0=-0.65$ for males (dashed line), while parameter estimates for the females were $\text{Linf}=395.6$, $k=0.411$, $t_0=-0.04$ (solid line). Maturity curves were estimated using logistic regression.

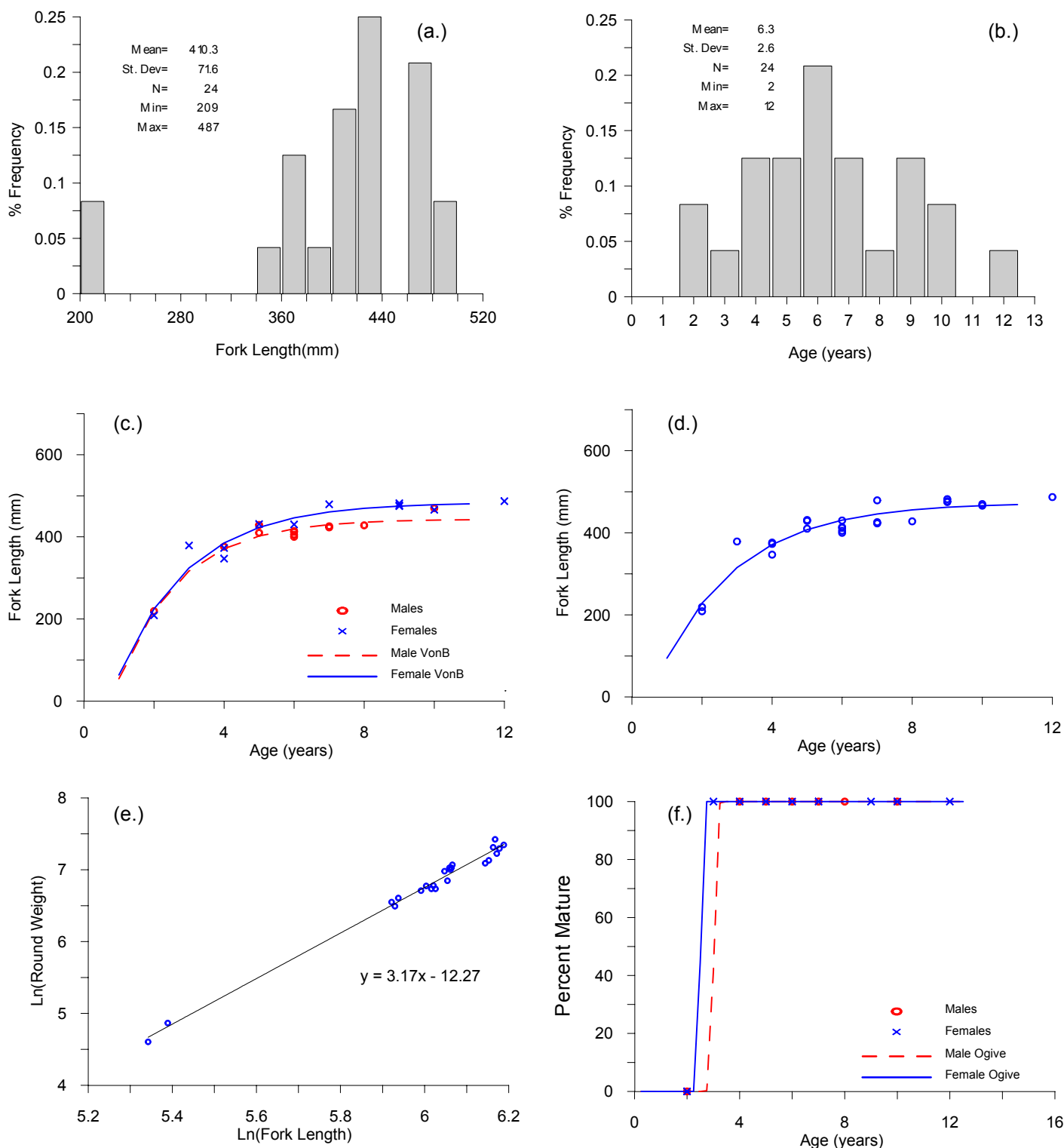


Figure 30. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of round whitefish caught in the 2004 Clapperton Island OSIA project (LHA_IA04_007). For the length at age and maturity plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{\infty}=443.3$, $k=0.561$, $t_0=0.77$ for males (dashed line), while parameter estimates for the females were $L_{\infty}=483.8$, $k=0.484$, $t_0=0.71$ (solid line). Maturity curves were estimated using logistic regression.

Table 13. Sample number, set date, latitude, longitude, effort duration and average water depth of experimental gill nets gangs set in western Georgian Bay, August 2004. GL19 nets are part of an on going evaluation of chub specific index gear.

Sample Number	Set Date	Latitude	Longitude	Gear Code	Effort Duration	Average Depth (m)
901	19-Jul-04	45° 16.99'	-081° 35.35'	GL32	23.91	59.03
902	19-Jul-04	45° 17.40'	-081° 35.63'	GL32	23.03	66.88
903	19-Jul-04	45° 17.74'	-081° 35.94'	GL19	22.01	55.48
904	20-Jul-04	45° 17.02'	-081° 31.27'	GL32	23.33	79.60
905	20-Jul-04	45° 16.71'	-081° 31.68'	GL32	23.58	79.83
906	20-Jul-04	45° 16.65'	-081° 32.36'	GL19	22.33	84.85
907	21-Jul-04	45° 16.94'	-081° 36.26'	GL32	22.08	82.44
908	21-Jul-04	45° 17.28'	-081° 36.36'	GL32	21.91	90.48
909	21-Jul-04	45° 17.60'	-081° 36.42'	GL19	21.75	84.68
951	03-Aug-04	45° 00.16'	-081° 08.78'	GL32	20.46	77.72
952	03-Aug-04	45° 00.61'	-081° 07.97'	GL32	20.65	75.99
953	03-Aug-04	45° 01.38'	-081° 08.97'	GL19	21.48	73.50
954	04-Aug-04	45° 02.94'	-081° 12.75'	GL32	68.96	79.26
955	04-Aug-04	45° 02.14'	-081° 13.52'	GL32	68.15	65.86
956	04-Aug-04	45° 03.58'	-081° 11.54'	GL19	69.80	104.50

Table 14. Count of fish by species caught in each mesh size of experimental gill nets set in western Georgian Bay, near Tobermory and Lions Head, August 2004. Only the catch in standard OSIA gear is presented, catch in GL19 nets are not included. Average CPUE is expressed as the mean number of fish caught per net per night. For most species, only nets that caught the species in question are included in the calculation of CPUE, but for deepwater chub, all net sets were included as they were the targeted species. The effective effort of nets that fished longer than a single night were adjusted for saturation as described in the text.

Species	Mesh Size (mm)									Total	CPUE
	032	038	051	064	076	089	102	114	127		
burbot				1						1	1.00
chub	23	167	222	23	8	6	2	2		453	45.30
lake trout								1		1	1.00
lake whitefish					1					1	1.00
Total	23	167	222	24	9	6	2	3	0	456	

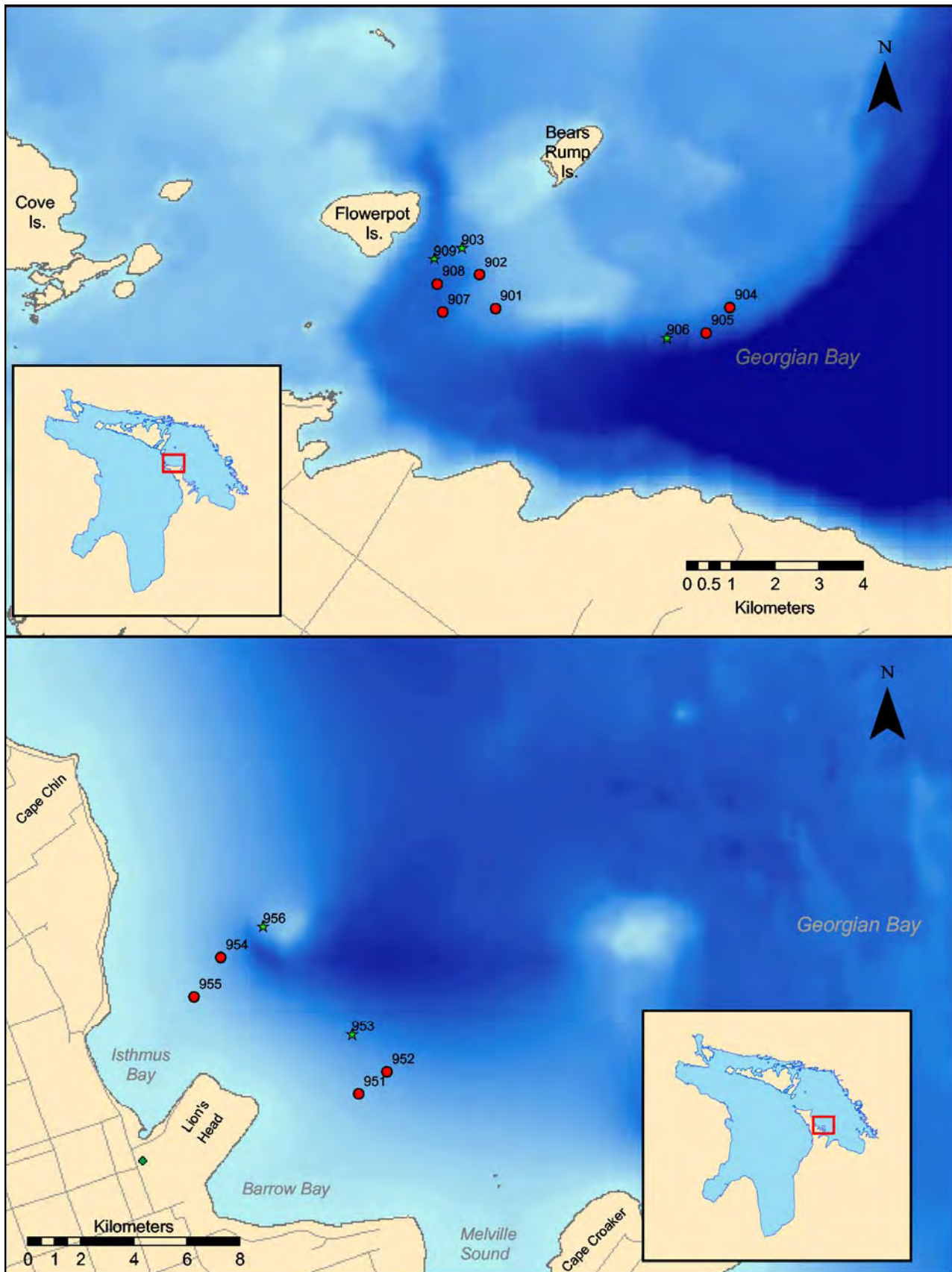


Figure 31. Offshore index sampling locations in western Georgian Bay near Tobermory (A) and Lions Head (B). Nets set in this index project target deepwater chub exclusively. Set locations of standard OSIA index gear (GL32) are represented by dots, the stars indicate locations where experimental, chub specific gill nets (GL19) were deployed as part of a comparison study. Nets were set in August 2004. (Project code LHA_IA04_009).

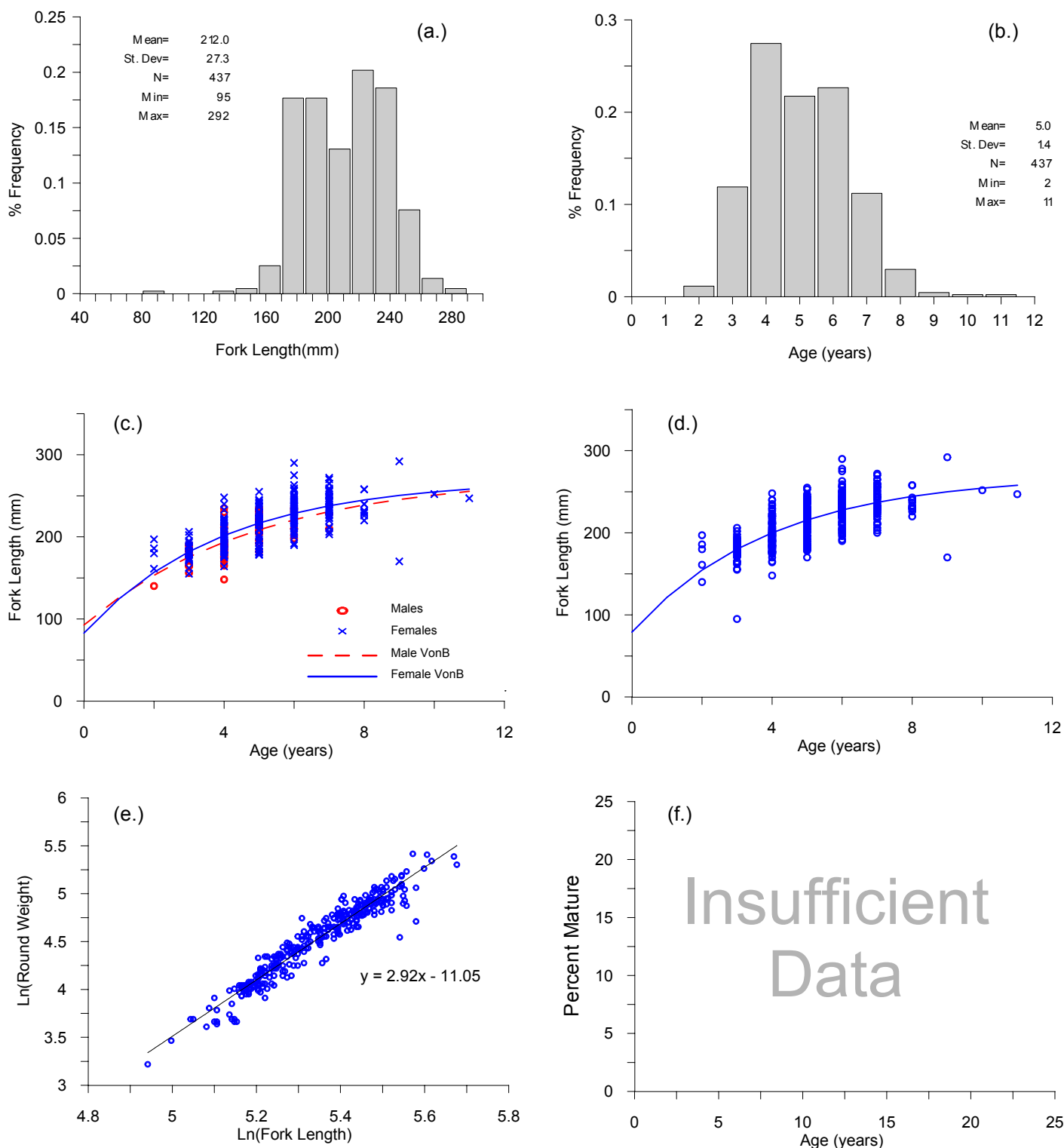


Figure 32. Fork length distribution (a), age distribution (b), fork length-at-age (by sex (c) and all fish combined (d)), weight-at-length (e), and maturity-at-age (f) of chub caught in the 2004 Tobermory/Lion's Head OSIA project (LHA_IA04_009). For the length at age plots male (o) and female (x) observations are presented separately. Fitted lines for fork length at age are Von Bertalanffy growth functions. Parameter estimates are $L_{\infty}=275.1$, $k=0.202$, $t_0=-2.03$ for males (dashed line), while parameter estimates for the females were $L_{\infty}=269.7$, $k=0.253$, $t_0=-1.45$ (solid line). There was not enough maturity data to generate curves for either sex.

Table 15. Pre-recruit indices for lake whitefish, deepwater chub and yellow perch from selected Quota Management Areas (QMAs) in Lake Huron. QMAs 4-4 and 4-5 are calculated from Southampton and Grand Bend OSIA data, respectively, while QMA 5-8 is in southern Georgian Bay (Cape Rich). QMA 6-1 includes data from the North Channel OSIA program, while GB-03 and GB-06 are Assessment Areas within QMA 5-3 and correspond to the Tobermory and Lion's Head OSIA projects, respectively. The 'Cut Off' indicated on the table refers to the minimum number of fish that need to be caught in a net for that sample to be included in the pre-recruit calculations and the 'Ages' value indicates the ages that are included in each pre-recruit index.

Year	QMA	Whitefish			Chub				Yellow Perch		
		4-4	4-5	5-8	4-4	4-5	GB-06	GB-03	4-4	4-5	6-1
Class	Cut Off	10	10	1	20	20	1	1	1	20	1
	Ages	1-3	1-3	1-3	2-4	3-4	3-5	3-5	1-3	1-3	1-4
1988							13.39	6.07			
1989					12.67	---	12.91	16.43			
1990		20.84	11.71	18.13	18.72	---	13.34	13.46	9.59	4.87	13.48
1991		10.29	12.81	7.97	2.42	---	9.79	5.57	69.07	15.83	15.28
1992		6.70	2.20	4.60	0.45	---	5.43	3.43	1.14	0.70	0.67
1993		7.21	13.38	6.49	2.63	---	4.17	4.50	14.71	6.95	7.92
1994		4.81	6.55	1.08	1.87	---	6.86	6.30	1.09	25.73	5.14
1995		5.44	8.70	10.51	3.58	---	6.20	10.73	3.81	18.19	11.69
1996		8.41	5.98	5.20	5.70	---	7.47	9.29	0.12	2.47	8.88
1997		4.94	11.06	1.21	19.20	---	6.18	9.08	0.88	4.61	11.30
1998		17.67	20.49	11.91	25.31	---	9.99	9.02	28.06	36.41	34.10
1999		18.54	10.68	36.51	20.17	---	16.50	17.52	2.31	4.02	8.60
2000		6.74	5.39	14.19	19.17	---	24.14	20.75	2.65	1.22	8.91
2001		6.17	7.53	14.71	3.99	---	14.67	12.92	4.90	2.39	0.45
2002		1.63	2.83	2.93	0.42				3.52	7.00	2.37
2003		55.48	39.72	0.81					26.23	22.24	1.71
Mean		12.49	9.18	10.42	10.45	---	10.49	10.16	10.91	10.03	9.91