

ELKHORN SLOUGH

TECHNICAL REPORT SERIES 2014: 2

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Shorebirds, waterfowl, and waders of Elkhorn Slough - quarterly surveys of migrants and residents (2003-2014)

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AUTHOR AFFILIATION

At the time the report was prepared, Fork was on the staff of ESNERR.

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ABOUT THE ELKHORN SLOUGH TECHNICAL REPORT SERIES

The mission of the Elkhorn Slough Foundation and the Elkhorn Slough National Estuarine Research Reserve is conservation of estuarine ecosystems and watersheds, with particular emphasis on Elkhorn Slough, a small estuary in central California. Both organizations practice science-based management, and strongly support applied conservation research as a tool for improving coastal decision-making and management. The Elkhorn Slough Technical Report Series is a means for archiving and disseminating data sets, curricula, research findings or other information that would be useful to coastal managers, educators, and researchers, yet are unlikely to be published in the primary literature.

Shorebirds, waterfowl, and waders of Elkhorn Slough - quarterly surveys of migrants and residents (2003-2014).

Overview and objectives

The tidal wetlands of Elkhorn Slough including its main channel, many side channels, and shallow lagoons with adjacent mudflats, provide a rich habitat for both migratory and resident shorebirds, waterfowl and waders. Birders keen to observe the spring and fall migratory events are sure to include Elkhorn Slough as a known hotspot to witness these migrations as well as enjoy the resident birds. Over the years, there has been some quantitative data collected on the birds of Elkhorn Slough, including annual Christmas bird counts and occasional Moss Landing Marine Laboratory student theses. Long time birders in the area often note differences between years, but these observations, since not consistently recorded, remain anecdotal.

In 2003, ESNERR began coordinating the first regular, quantitative, consistent monitoring of the Slough's shorebirds, waterfowl, and waders over time. The objective of this monitoring effort is to track these migratory (and resident) birds using the tidal wetland of Elkhorn Slough. While this modest program will not be sufficient to detect subtle alterations, we will be able to detect dramatic changes. By comparing our results to those from other wetlands along the coast, we can determine whether the changes are due to local factors affecting only the Slough (loss of foraging areas due to tidal scour, elimination of prey due to oil spill, etc.) or regional processes affecting the whole coast (breeding failure, El Nino effects on prey recruitment, etc.). In addition to broad spatial comparisons, we can also compare the results of our surveys to those at similar times of year done by past MLML grads B. Ramer and S. Connors. This program will provide valuable information about how ESNERR is used by resident and migratory shorebirds, waterfowl, and waders and is the beginning of a long term monitoring program. The results presented here are from the first twelve years of the study (2003-2014) unless otherwise noted.

Methods

Field censuses:

Twice each spring and fall volunteers carry out the monitoring protocol. Surveys will take place within 2 hours of low tides listed between +2.0 and -1.5 feet. Volunteers count birds at four census stations: South Marsh (Big Lagoon and Five Pans), Parsons Slough, North Harbor, and Elkhorn Slough main channel. An additional site, North Marsh, is surveyed at high tide (data not included in this report). At each station, all birds actively using the area (swimming, wading, hunting from above) are included; birds just passing by overhead are not counted. Upon arriving at a station, the volunteers first identify all birds present. They then begin a timed watch and count the maximum number of birds present in the area during this period. Birds are counted only within a defined area (boundaries are shown on a map carried by the volunteers on their clipboard). Regular volunteer participants include: J. de la Torre, L. Jordan, S. Murphy, C. Rodgers, T. Newberry, R. Eby, S. Gaebelein, B. and B. Ramer, W. and L. Goldfrank, C. Eyster, D. Glasco, I. M. Laursen, J. Harvey, K. Wasson, L. Catterall and students, R. Fournier, B. Adler, K. Pollak, S. Dudek, C. Kempf, M. Fountain, S. Wagoner, R. Carle, S. Wodtke, S. Burkett, S. Palmer, B. Nethercutt, C. Howe, S. Webb, and W. Tipton.

Data analysis for this report:

Data were pooled by season (spring and fall), site (Main Channel, Parsons Slough, North Harbor, South Marsh) and bird group unless otherwise stated.

Seasons: Spring (Mar and April) and fall (September and November; occasionally late-August).

Years of surveys: Spring (2006-2014); Fall (2003-2013).

Sites: individual sites (Estrada, Main Channel, North Harbor, North Marsh, Parsons Slough and slough-wide “Elkhorn Slough” (excludes Estrada and North Marsh).

Bird groups: Loons and Grebes, Pelicans, Cormorants, Herons and Egrets, Waterfowl (ducks, buffleheads, widgeons, and scoters), Shorebirds (killdeer, godwits, curlews, sandpipers, sanderlings, plovers, avocets, stilts, dowitchers, yellowlegs, and dunlins), Gulls, and Terns.

Abundance and species richness: Total abundance and number of species (as well as averages) were compared across season and year.

Fall surveys: An ANOVA was carried out for the following datasets: total abundance, species richness, and individual bird groups, using September and November survey data as the “replicates”.

Results

Overall, slough-wide total abundance and species richness were quite variable both between seasons and years (Fig. 1, 2). Maximum spring abundance was 13023 birds (March 2012), averaging 8565 birds, while in fall was as high as 26640 birds in November 2013 (averaging 16052 birds) (Fig. 1, 3a). The maximum number of species (i.e. species richness) observed in spring and fall was similar: 53 species in March (2012) (average 46 species) and 55 species in November (2013) (average 41 species) (Fig. 2, 3b). Species richness was most variable in fall ranging from a low of 31 species observed in September 2003 and 2005 (and 2011 in late Aug) to 55 species tallied in November 2013 (Fig. 2). For fall-only surveys, species richness and abundance did not vary significantly between years (ANOVA) (Fig. 6; Table 1). Of individual bird groups, only Shorebirds varied significantly by year (ANOVA) (Table 1; Fig. 8b).

Individual bird groups varied both seasonally and yearly (Fig. 4, 5; see Fig. 7, 8 for fall-only data):

- LOONS AND GREBES: Peak abundances were similar for spring and fall surveys (206 birds in March 2009 and 292 birds in November 2012) (Fig. 4a).
- CORMORANTS: Maximum spring abundance was 264 birds in March 2014 and in fall was 386 birds (November 2005) (Fig. 4b).
- PELICANS: Maximum abundance was much lower in spring than in fall (184 birds in April 2010 vs. 1568 birds in late-August 2006) (Fig. 4c).
- HERONS AND EGRETS: Peak abundances were similar in both spring and fall surveys; 189 individuals were counted in April 2006 and 185 in November 2007 (Fig. 4d).
- WATERFOWL: Maximum abundance in spring was much greater than in fall (2609 birds in March 2011 vs. 1206 birds in November 2011). Interestingly the September 2005 survey recorded only 2 waterfowl (mallards) (Fig. 5a).
- SHOREBIRDS: Peak abundance in spring was 10592 birds (April 2011) and 21341 birds in fall (September 2009) (Fig. 5b).

- GULLS: Maximum abundances between spring and fall were highly divergent, tallying 1925 birds in April 2013 and 9174 birds in November 2005 (Fig. 5c).
- TERNS: Maximum spring abundance was 285 birds in April 2013. Peak abundances were highly variable in fall (September), ranging from two birds in 2007 and 2011 to 535 birds in 2013 (Fig. 5d).

Total bird abundance of boat surveys of the main channel varied by year, though not significantly (Fig. 9; ANOVA, $P = 0.47$); abundance was greater in fall than in spring (Fig. 10). For the land-based (“walk-in”) surveys, total abundance varied by site (Fig. 11).

Discussion

The results revealed that species richness and abundance have apparently been fairly stable at Elkhorn Slough during the period 2003-2014, although there are some seasonal differences. Bird abundance was greatest in fall, with nearly twice as many birds counted as compared to spring surveys. The greatest abundance, with over 26,000 birds counted, was recorded in the November 2013 survey, while the April 2013 survey had the least, at only 3646 birds. The number of observed species was similar between spring and fall surveys, although fall was more variable.

These analyses from the first twelve years provide a preliminary baseline of bird abundances and species data of Elkhorn Slough and may help to contribute toward a greater understanding of Pacific Coast shorebird and waterfowl population dynamics. While this modest program will not be sufficient to detect subtle alterations, we will be able to detect dramatic changes. By comparing our results to those from other wetlands along the coast, we can determine whether the changes are due to local factors affecting only the Slough (loss of foraging areas due to tidal scour, elimination of prey due to oil spill, etc.) or regional processes affecting the whole coast (breeding failure, El Nino effects on prey recruitment, etc.).

Elkhorn Slough is, in fact, one of forty-six sites recognized by the Western Hemisphere Shorebird Research Network (WHSRN) as critically important because it provides essential wintering and migratory stopover habitat along the Pacific Flyway. As one of the largest estuaries on the California coast, Elkhorn Slough supports as many as 300 species of birds and 38 species of shorebirds (Senner and Howe 1984; Ramer, Page, and Yoklavich 1991; Page et al. 1992), making it among the most species-rich sites for birds in the state of California.

Literature Cited

- Page, G. W., Stenzel, L. E., and J. E. Kjelson. 1999. Overview of shorebird abundance and distribution in wetlands of the Pacific coast of the contiguous United States. *Condor* 101:461-471.
- Ramer, B. A., G. W. Page, and M. M. Yoklavich. 1991. Seasonal abundance, habitat use, and diet of selected shorebirds in Elkhorn Slough, California. *Western Birds* 22:157-174.

Senner, S. E., and M. A. Howe. 1984. Conservation of Nearctic shorebirds. Pages 379-421 *in* Shorebirds: breeding behavior and populations. Behav. Marine Anim. Vol 5. (J. Burger and B. L. Olla, Eds.). Plenum Press, New York.

Waterbird surveys (2003-2014)

Spring

Fall

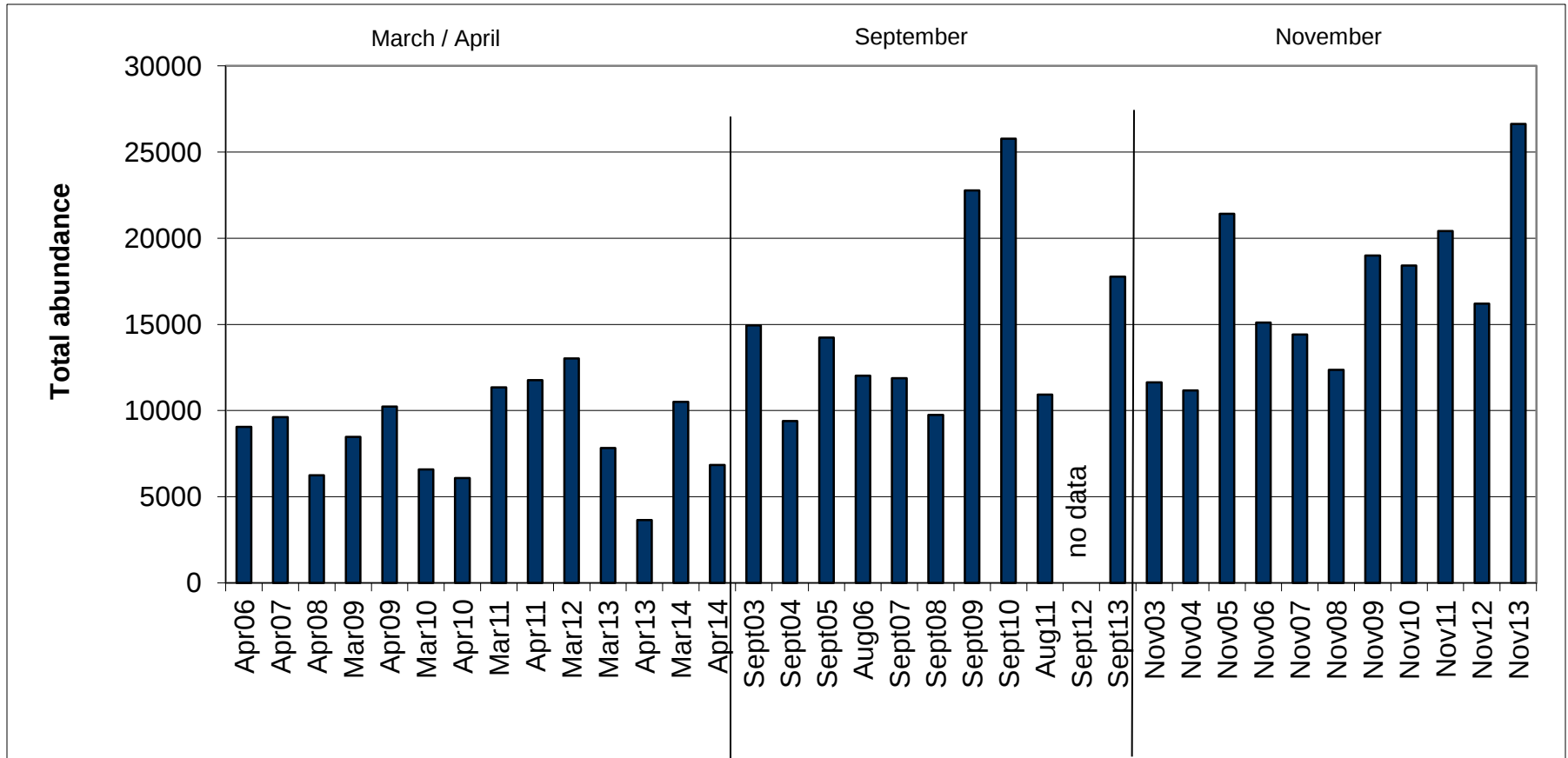


Fig. 1. Total abundance of waterbirds (shorebirds, waterfowl, divers, waders, gulls and terns) at Elkhorn Slough, 2003-2014. Sites included in total: Main channel of Elkhorn Slough, North Harbor, Parsons Slough and South Marsh.

Waterbird surveys (2003-2014)

Spring

Fall

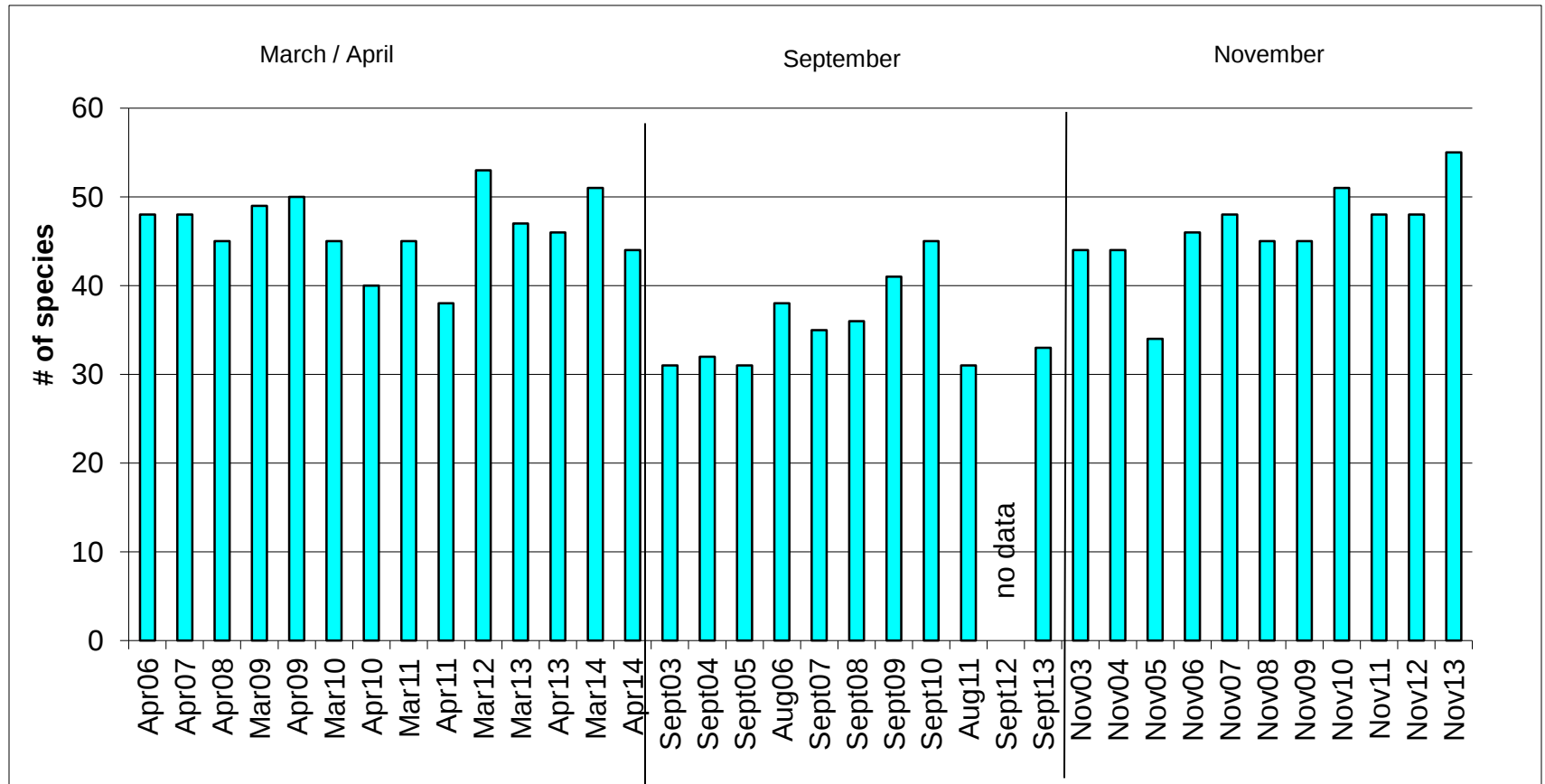


Fig. 2. Species richness of waterbirds (shorebirds, waterfowl, divers, waders, gulls and terns) at Elkhorn Slough, 2003-2014. Sites included in total: Main channel of Elkhorn Slough, North Harbor, Parsons Slough and South Marsh.

Waterbird surveys (2003-2014)

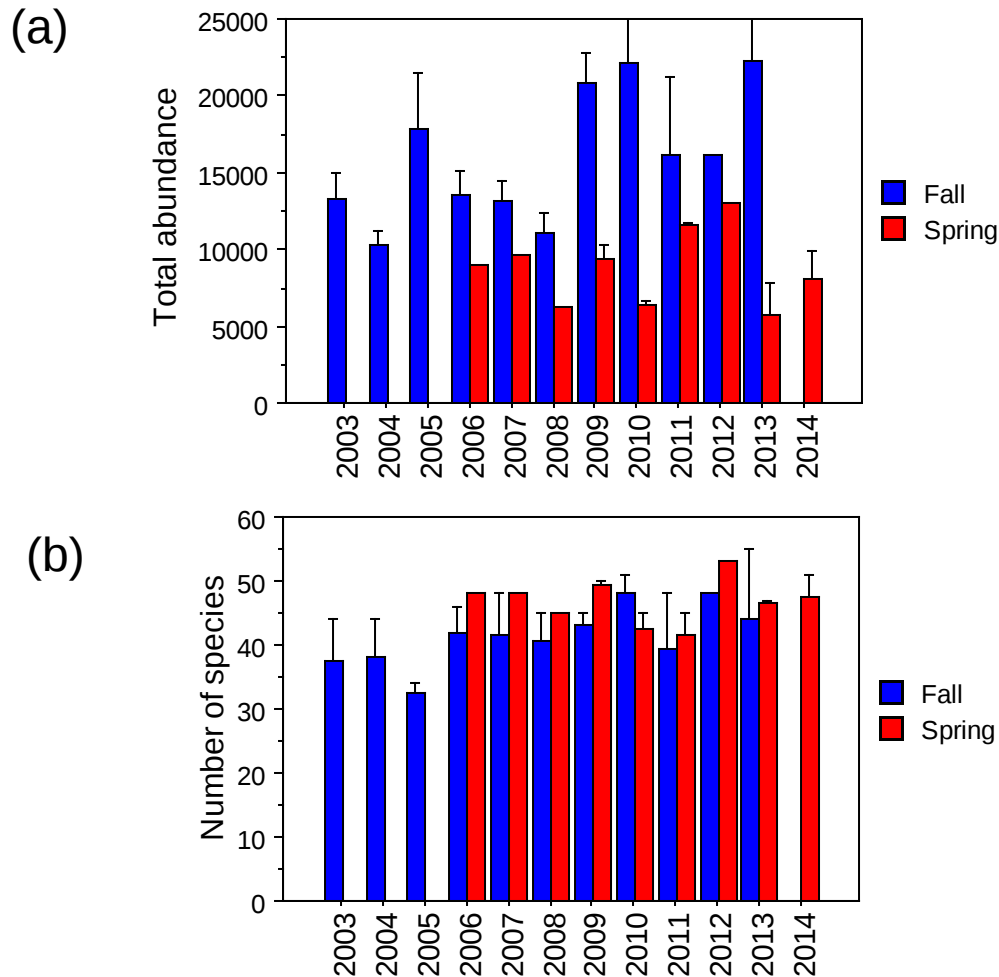


Fig. 3. Total abundance and species richness of waterbirds (shorebirds, waterfowl, divers, waders, gulls and terns) at Elkhorn Slough, 2003-2014. Sites included in total: Main channel of Elkhorn Slough, North Harbor, Parsons Slough and South Marsh. Average of spring (March and April) or fall (Sept and Nov) surveys. (Spring surveys began in 2006.)

Waterbird surveys (2003-2014)

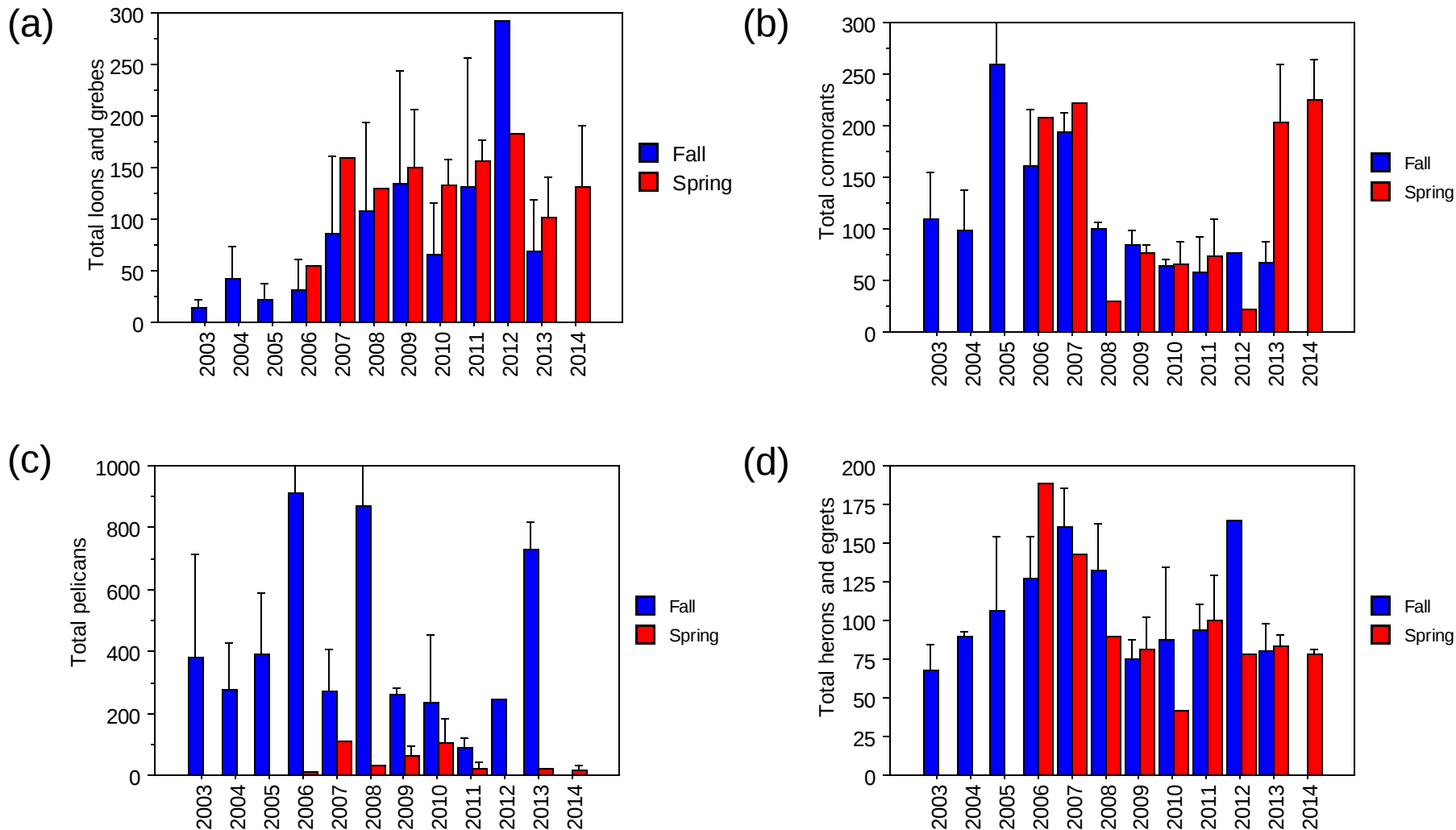


Fig. 4. Total abundance of waterbird groups (a) loons and grebes, (b) cormorants, (c) pelicans, and (d) herons and egrets at Elkhorn Slough, (2003-2014). Averages of spring (March and April) or fall (Sept and Nov) surveys. Sites surveyed: Main channel of Elkhorn Slough, North Harbor, Parsons Slough, and South Marsh. (Spring surveys began in 2006.)

Waterbird surveys (2003-2014)

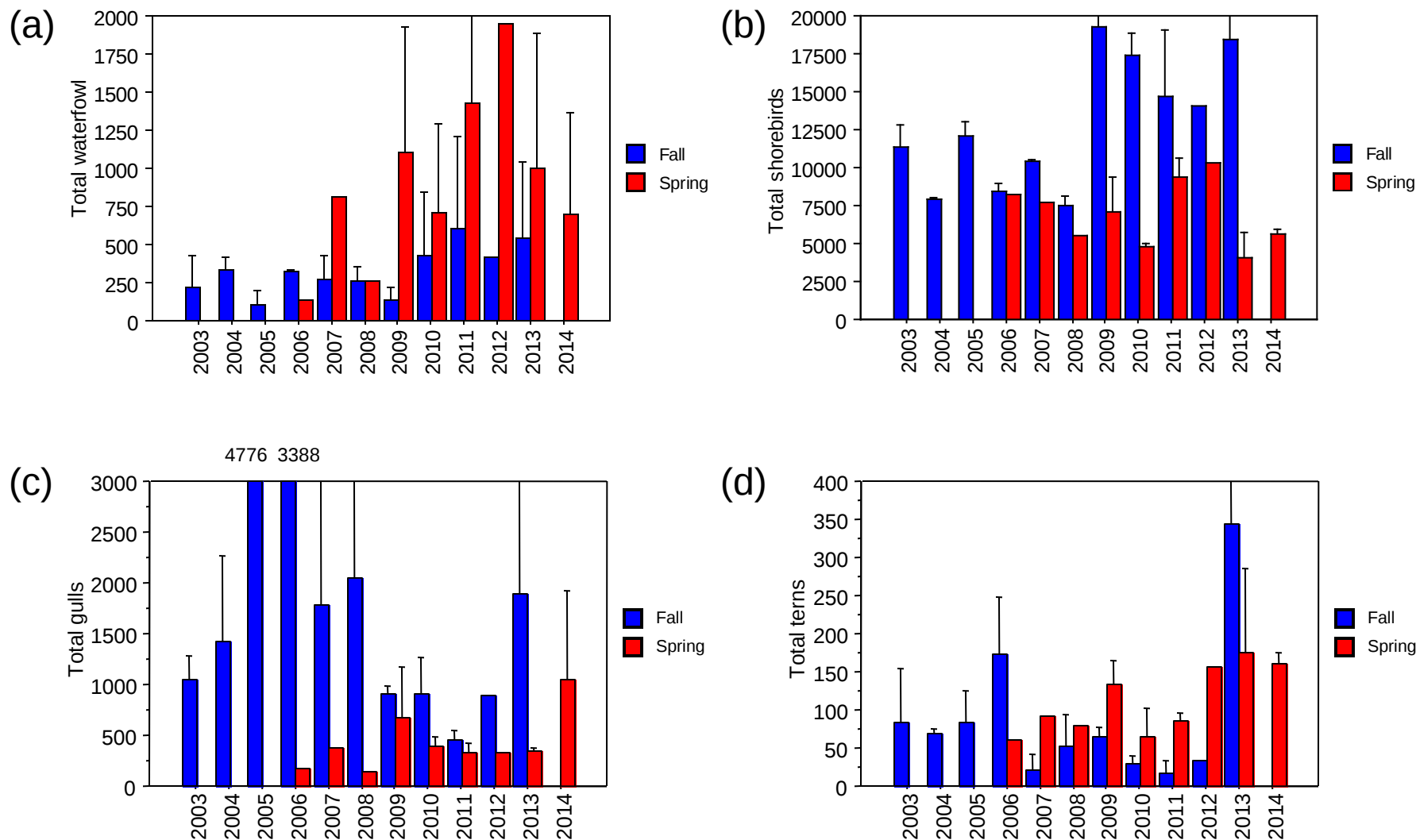


Fig. 5. Total abundance of waterbird groups, (a) waterfowl, (b) shorebirds, (c) gulls, and (d) terns at Elkhorn Slough, (2003-2014). Average of spring (March and April) or fall (Sept and Nov) surveys. Sites surveyed: Main channel of Elkhorn Slough, North Harbor, Parsons Slough, and South Marsh. (Spring surveys began in 2006.)

Waterbird surveys (2003-2013)

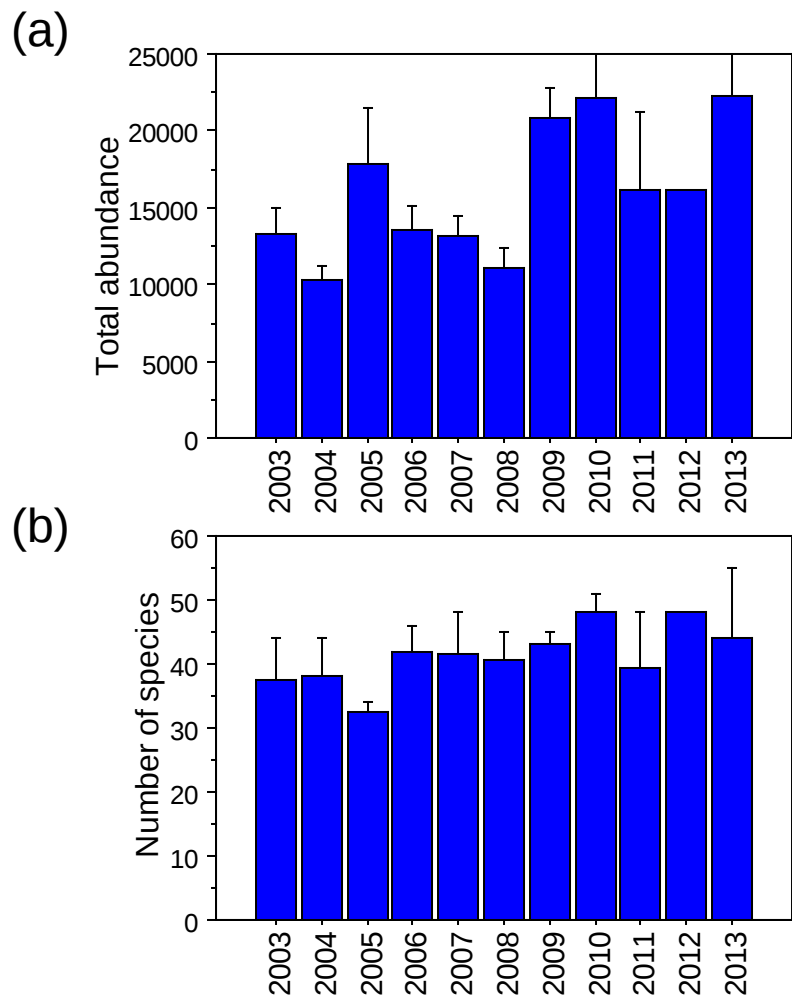


Fig. 6. Total abundance and number of waterbird species (shorebirds, waterfowl, divers, waders, gulls, and terns) at Elkhorn Slough (2003-2013) in fall. Average of September and November surveys. Sites surveyed: Main channel of Elkhorn Slough, North Harbor, Parsons Slough, and South Marsh (see Table 1 for associated *P-values*).

Waterbird surveys (2003-2013)

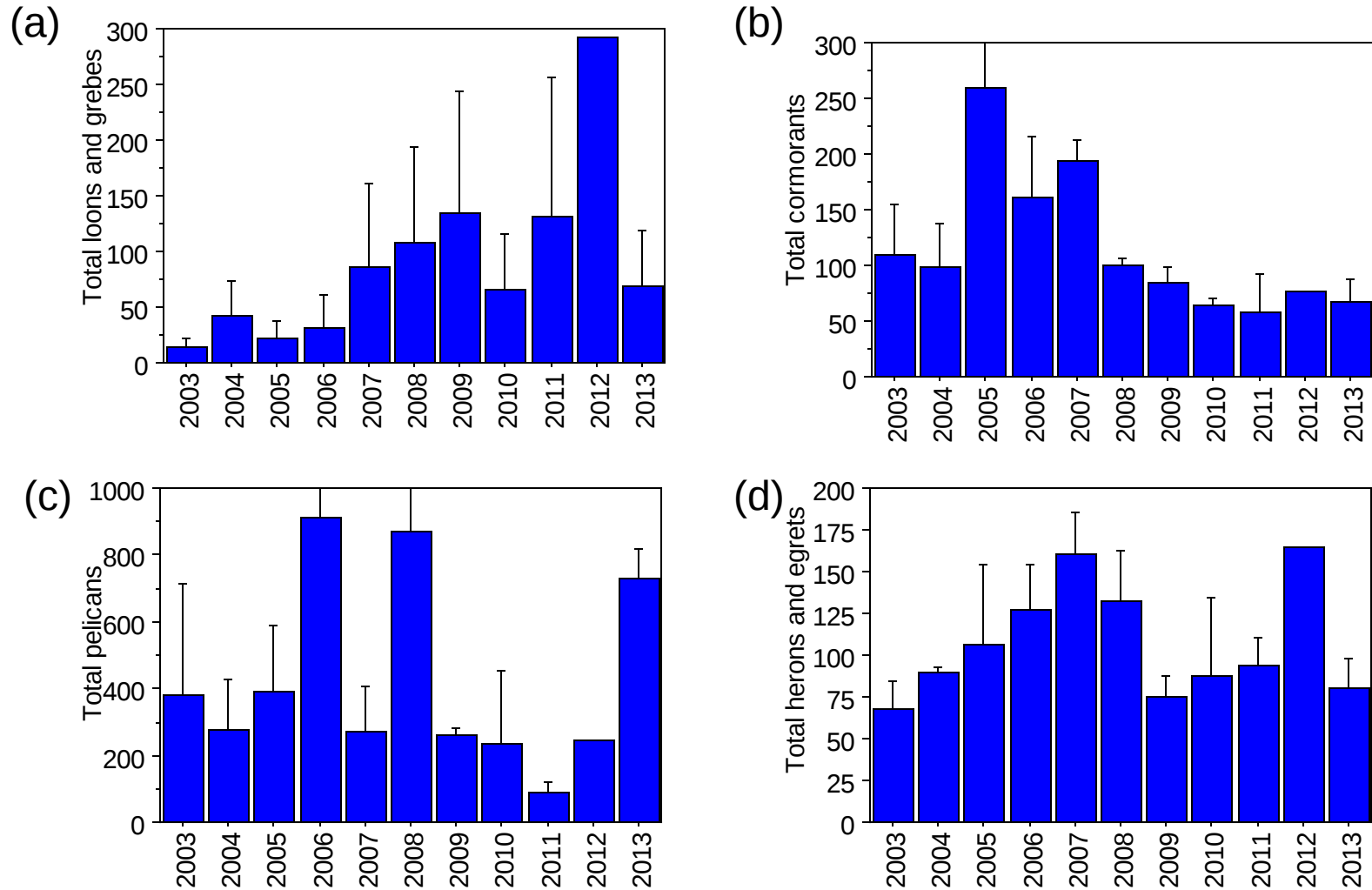


Fig. 7. Total fall (Sept and Nov averaged) abundance of bird groups, (a) loons and grebes, (b) cormorants, (c) pelicans, and (d) herons and egrets, at Elkhorn Slough, compared by year (2003-2013). Sites surveyed: Main channel of Elkhorn Slough, North Harbor, Parsons Slough, and South Marsh (see Table 1 for associated *P*-values).

Waterbird surveys (2003-2013)

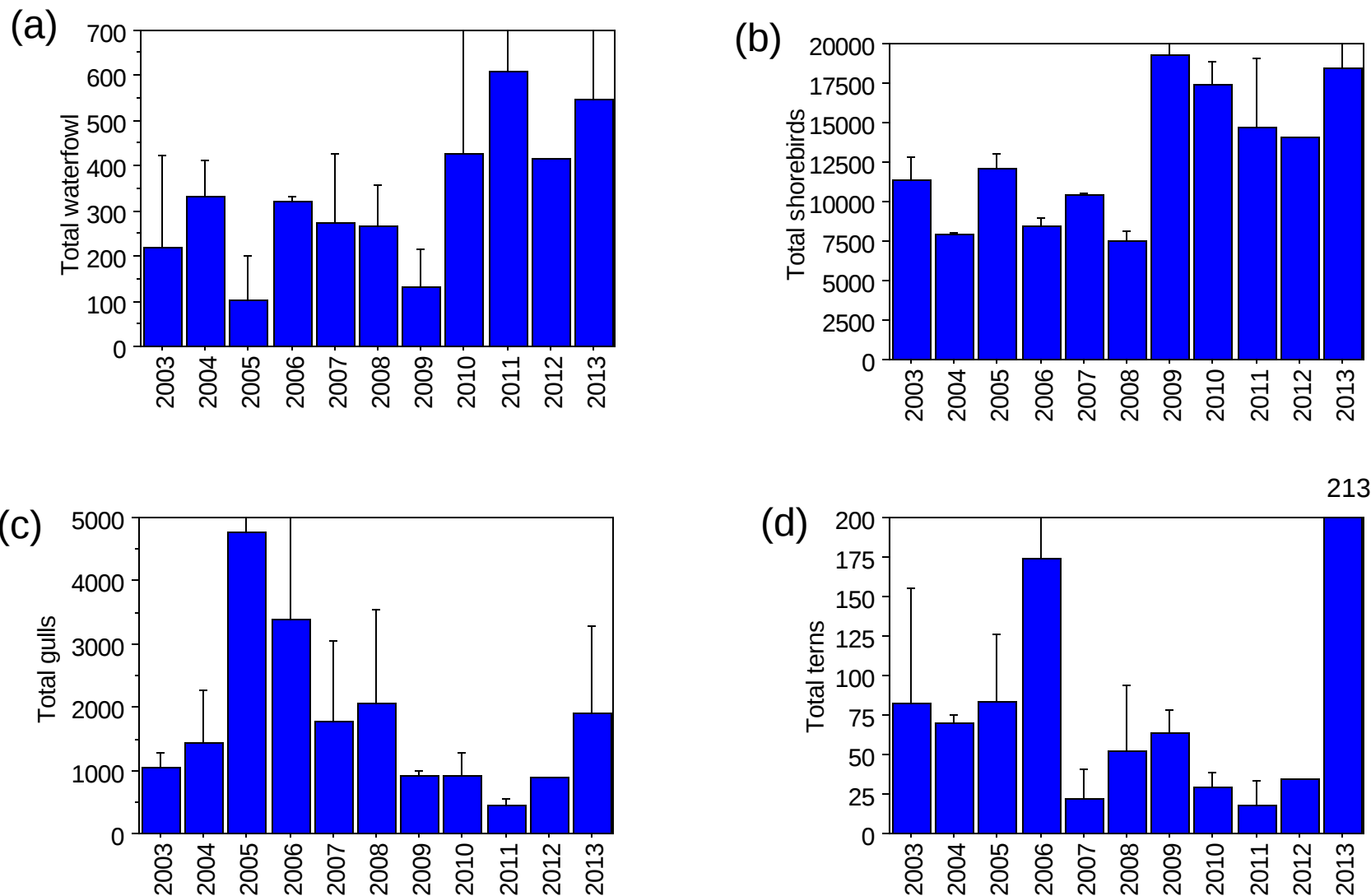


Fig. 8. Total fall (Sept and Nov averaged) abundance of bird groups, (a) waterfowl, (b) shorebirds, (c) gulls, and (d) terns, at Elkhorn Slough, compared by year (2003-2013). Sites surveyed: Main channel of Elkhorn Slough, North Harbor, Parsons Slough, and South Marsh (see Table 1 for associated *P*-values).

Waterbird surveys (2003-2013)

Category	<i>P</i> -value (ANOVA)
Loons / grebes	0.59
Pelicans	0.45
Cormorants	0.23
Herons / egrets	0.37
Waterfowl	0.97
Shorebirds	0.01
Gulls	0.87
Terns	0.20
Number of species	0.85
Total abundance	0.13

Table 1. Results of ANOVA of total fall abundance, number of species, and individual bird groups at Elkhorn Slough, compared by year (2003-2013) (September and November averaged). Sites surveyed: Main channel of Elkhorn Slough, North Harbor, Parsons Slough, and South Marsh.

Waterbird surveys (2003-2013)

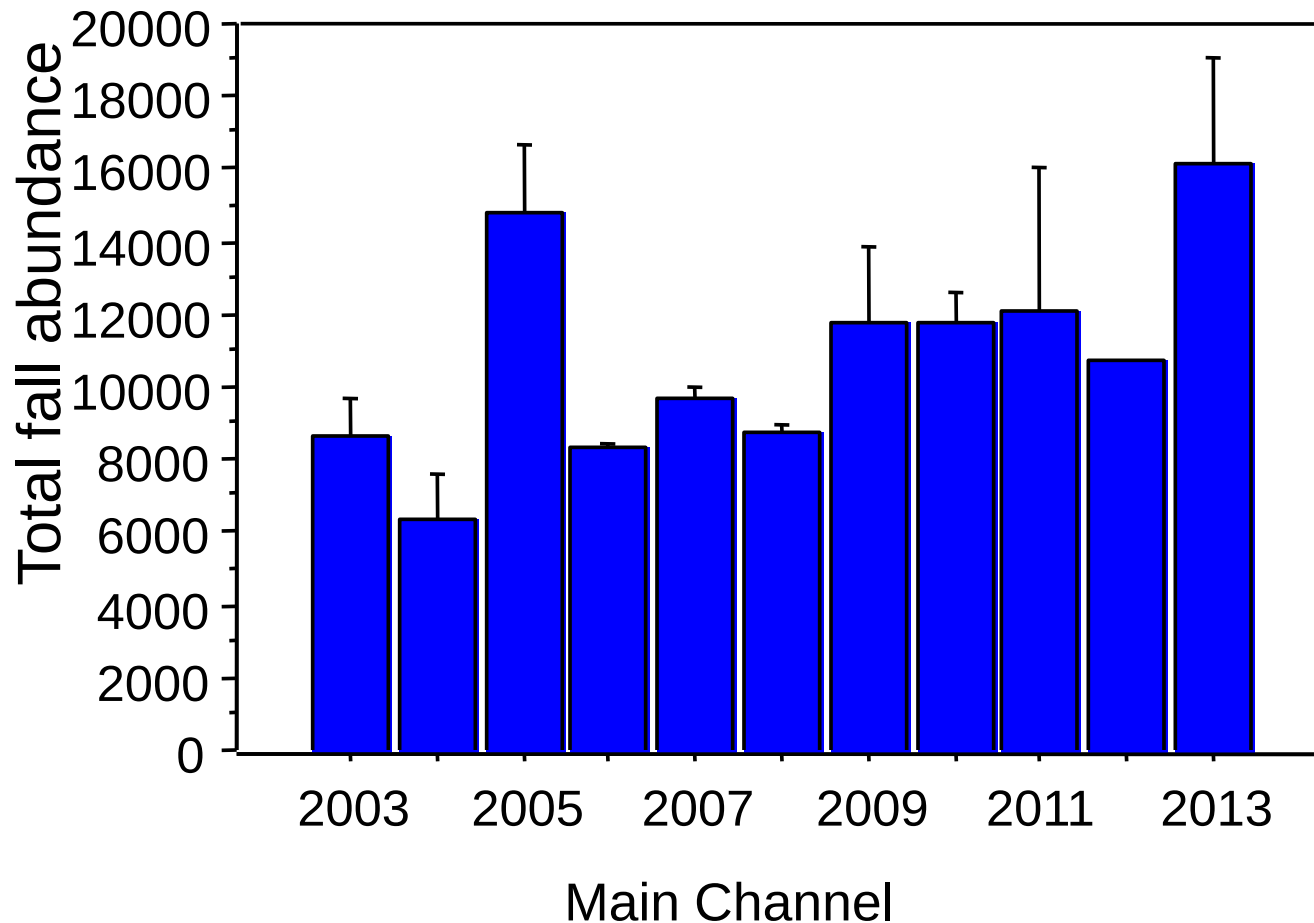


Fig. 9. Total fall abundance of waterbirds (shorebirds, waterfowl, divers, waders, gulls and terns) in main channel of Elkhorn Slough, 2003-2013. Average of Sept and Nov surveys.

Waterbird surveys (2003-2014)

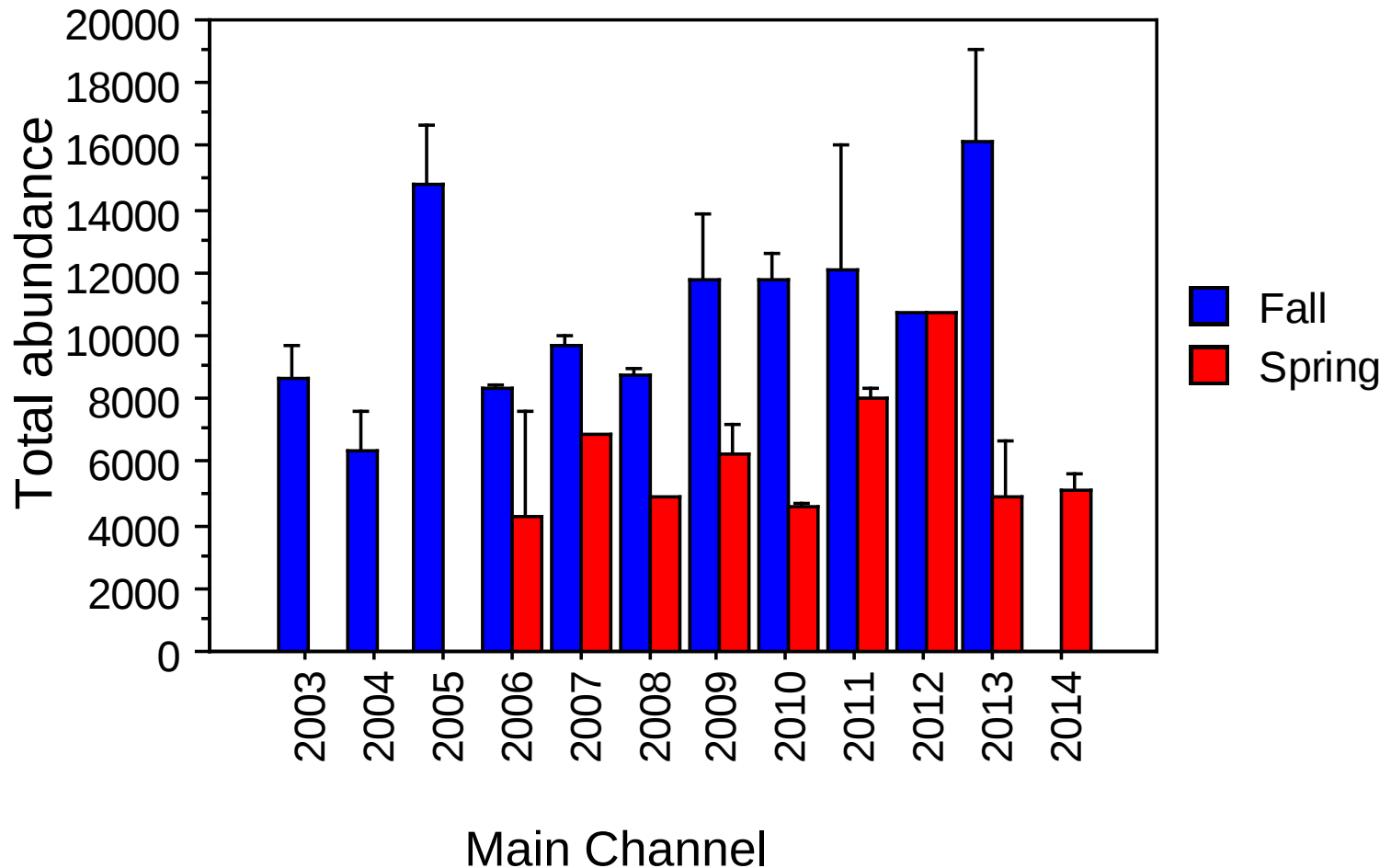


Fig. 10. Total abundance (shorebirds, waterfowl, divers, waders, gulls and terns, Main channel of Elkhorn Slough, 2003-2014). Average of spring (March and April) or fall (Sept and Nov) surveys. (Spring surveys began in 2006)

Waterbird surveys (2003-2013)

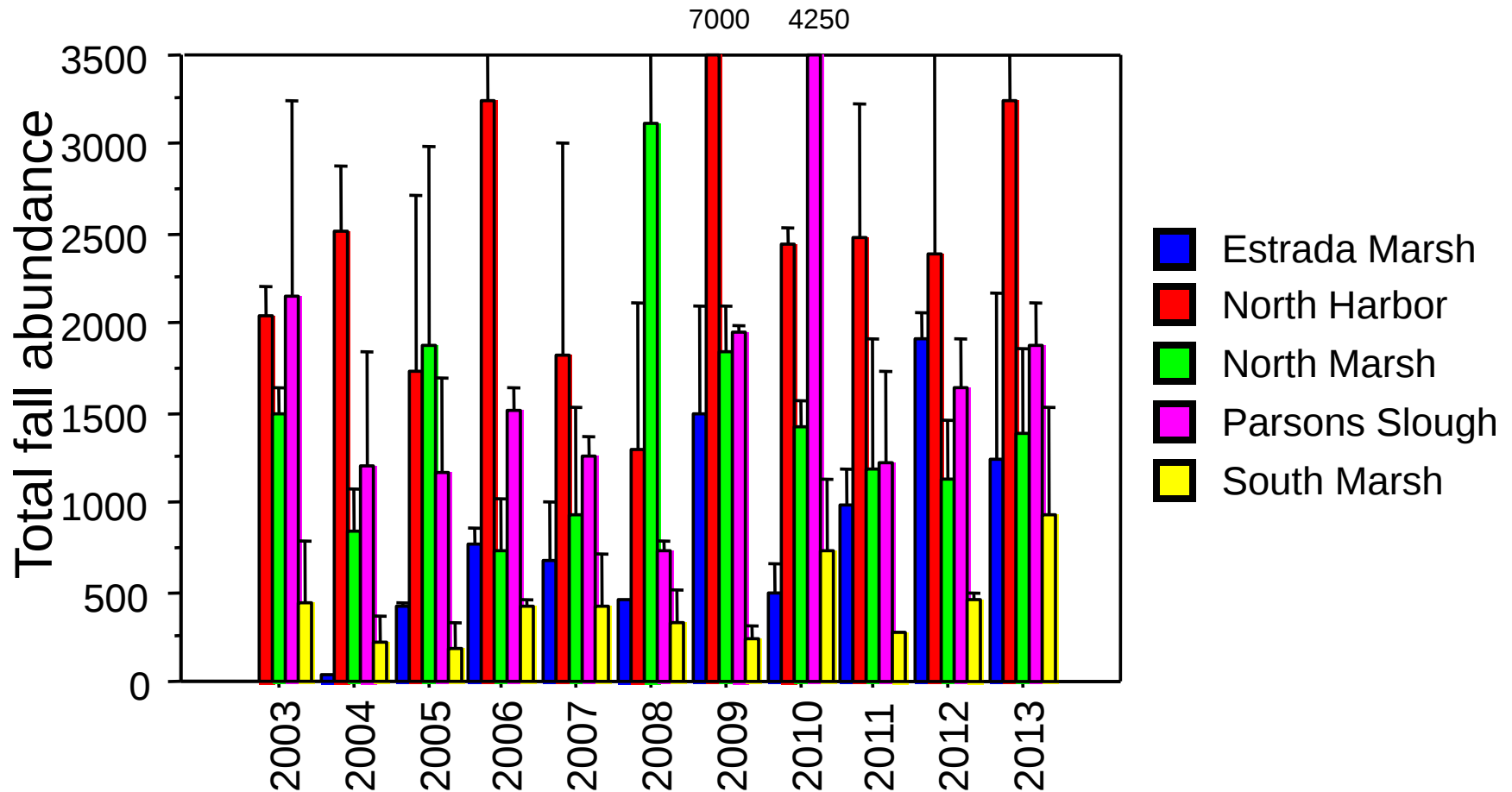


Fig. 11. Total fall abundance of waterbirds (shorebirds, waterfowl, divers, waders, gulls and terns) 2003-2013. Average of September and November surveys (Estrada not surveyed in 2003).