DOCUMENTED OCCURRENCES OF BIRD SPECIES ON TOMALES BAY, CALIFORNIA, PRIOR TO JANUARY 2003, AND A PROTOCOL FOR FUTURE BIRD SPECIES INVENTORIES

A report to the Point Reyes National Seashore

and the All Taxa Biodiversity Inventory of Tomales Bay

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CONTENTS

SUMMARY

As part of an All Taxa Biodiversity Inventory (ATBI) for Tomales Bay, California, we analyzed 13 years of standardized shorebird and waterbird survey data, the results of numerous published and unpublished reports, and verified anecdotal documentation of bird species occurrences in Tomales Bay.

A comprehensive list of bird species, keyed by taxonomic hierarchy, seasonality, special status categories, preferred habitats, relative abundance, and occurrence within sub-areas, indicates 163 species known to occur or have occurred in Tomales Bay below the mean higher high tide level. These include 122 species that occur regularly or occasionally and 41 species that occur only rarely with less than five documented occurrences. Species normally associated with adjacent habitats were included only if their presence was considered to indicate use of suitable habitats in Tomales Bay. Based on species occurrences in other areas along the Pacific Coast, we predicted that the following undetected species are likely to be found on Tomales Bay: Arctic Loon (*Gavia arctica*), Northern Fulmar (*Fulmaris glacialis*), Steller's Eider (*Polysticta stelleri*), Wilson's Phalarope (*Phalaropus tricolor*), and Sabine's Gull (*Xema sabini*).

We also recommended specific protocols for shorebird and waterbird surveys. Analysis of randomized species accumulation curves suggested that optimal efficiency for detecting species (but not necessarily species abundances) can be achieved by conducting 20-35 baywide winter waterbird surveys over a period of five years; a minimum of 20 baywide counts of wintering shorebirds over five years; and a minimum of 20 baywide shorebird counts each during the fall and spring migration periods over at least five years.

A bibliography of relevant literature on birds of Tomales Bay is included in the report. The Cypress Grove Research Center of Audubon Canyon Ranch, in Marshall, CA, conducts ongoing shorebird and waterbird monitoring programs on Tomales Bay.

INTRODUCTION

The Tomales Bay All Taxa Biodiversity Inventory (ATBI) is a cooperative project involving several independent investigators and organizations, and is currently coordinated by the Point Reyes National Seashore Association. The objectives of the ATBI include conducting inventories of species of plankton, vascular and non-vascular plants, benthic and intertidal invertebrates, fishes, mammals, and birds; completing a comprehensive list of species in Tomales Bay; and consolidating existing and new information into a single geographic information system (GIS). Other objectives involve opportunities for education, strategies for restoration, and providing information to scientists and others interested in the biological diversity of Tomales Bay. To assist in initiating the ATBI, the Point Reyes National Seashore provided initial funding to compile existing information on several taxonomic groups, including birds.

Existing information on bird species occurrences in Tomales Bay is comprehensive and thorough enough that compiling and interpreting currently available data can achieve the primary objectives of the ATBI for birds. Therefore, we have produced in this report the following information for the ATBI:

- Analysis of bird species occurrence based on 13 years of standardized shorebird and waterbird surveys, including percent occurrence within 12 sub-areas of Tomales Bay
- Protocols for future shorebird and waterbird surveys in Tomales Bay, including an analysis of optimal survey efficiency with regard to the proportion of species detected
- A comprehensive list of documented bird species occurrences in Tomales Bay, keyed by taxonomic hierarchy, seasonality, special status categories, relative abundance, preferred habitats, and occurrence within sub-areas

- An estimate of the number of bird species in Tomales Bay, with regard to normal and rare occurrences
- A list of new (undetected) species expected to occur, based on information from other areas
- A bibliography of relevant literature on birds in Tomales Bay

The use of adjacent wetlands by birds has been reported elsewhere, including (1) breeding and wintering seasons in Livermore Marsh, in Marshall (Kelly 1989-96, Kelly 1990-96; J. Kelly, unpubl.); (2) breeding and wintering seasons in Olema Marsh, adjacent to the lower (tidal) reach of Lagunitas Creek (Evens and Stallcup 1991-94a, Evens and Stallcup 1991-94b; ACR Files); and (3) autumn migration, breeding, and wintering seasons in the leveed pastures and seasonal wetlands of the Giacomini Ranch, where a planned 550-acre (223-ha) marsh restoration will return most of the area to tidal conditions (Avocet Research Associates 2002).

The shorebird and waterbird surveys described in this report represent currently active, ongoing monitoring programs conducted by the Cypress Grove Research Center of Audubon Canyon Ranch, in Marshall, CA. Therefore, additional species may be detected by these surveys, and further verification of the patterns presented here may be possible in the future.

METHODS

The inventory of bird species in Tomales Bay involved compiling five types of existing information. First, the results of continuing baywide shorebird and waterbird abundance surveys were summarized with regard to probability of species occurrences within survey sub-areas (Tables 2-5). Second, we generated species accumulation curves to predict survey efficiencies

and to determine the expected number of bird species using Tomales Bay. Third, we compiled other existing survey data and anecdotal records, along with the results of the continuing surveys, into a database of documented occurrences bird species in Tomales Bay prior to 1 January 2003. Fourth, based on known occurrences of bird species in other areas along the Pacific Coast, we identified several undetected species that are likely to occur in Tomales Bay. Fifth, we used supporting literature and data sources to generate a list of references related to bird species occurrences in Tomales Bay.

Waterbird surveys

Baywide monitoring of waterbird and shorebird species abundances continues, based on methods used in developing existing survey data for waterbirds and shorebirds (Kelly and Tappen 1998, Kelly 2001). The waterbird survey data represent 39 baywide surveys of wintering waterbirds, averaging three per year ($\bar{x}$ = 3.0, std. dev. = 1.0) from mid-December to late February, over 13 years (1989-90 to 2001-02). "Waterbirds" surveyed included all bird species that normally occur in coastal or estuarine habitats or Tomales Bay, up the mean higher high tide level, with the exception of sandpipers (Scolopacidae), plovers (Charadriidae, and large and medium-sized gulls (Laridae; Table 2). Some species that use adjacent habitat but normally associate with the bay were also included, such as Belted Kingfisher, Peregrine Falcon, Osprey, and Northern Harrier.

Each baywide waterbird survey encompassed simultaneous counts from three 17-to-21-foot Boston Whalers or similar boats traveling in formation along parallel 18-km transects, from Millerton Point near the south end of the bay north to the Sand Point Buoy, and supplementary counts from standard shoreline locations (Figure 1). Survey data were partitioned into twelve sub-areas defined by four sections along the long axis of the bay (marked by boundary lines

perpendicular to the west shore and extending through the outer tips of Sand Point, Tom's Point, Pelican Point, and Tomasini Point) and by parallel east-shore, west-shore, and mid-bay transects extending along the length of the bay (Figure 1). Boats following the east-shore and west-shore transects each carried one team of observers. The mid-bay boat carried two (port and starboard) teams. Each team consisted of two competent waterbird observers, using binoculars, and one data recorder. Observers on the east-shore boat counted all waterbirds in a transect bounded by the path of their boat and the east shore. Similarly, observers on the west-shore boat counted all waterbirds in a transect bounded by the path of their boat and the west shore. Observers on the mid-bay boat counted all waterbirds between the other two boats. Drivers of the east- and west-shore boats continually adjusted their positions visually to maintain roughly equal distances between boats and transect boundaries. Therefore, shoreline transects each represented approximately a fourth of the areal extent of the Bay and the mid-bay transect covered approximately half of the bay's extent.

We maintained continual radio communication among observation boats to facilitate adjustments of inter-boat and boat-to-shore distances, and to clarify counts of confusing birds or flocks along the transect borders. Observers on each boat counted only those birds that passed southward through an imaginary vertical plane defined by the bows of the three boats. The boats traveled at velocities of about 4 knots, but occasionally we stopped to count dense aggregations of birds. Birds flushing ahead of the moving boats were not counted until they eventually passed southward through the observation plane. Birds passing northward over or around the boats were subtracted from the counts, but this seldom occurred as long as boats maintained a constant velocity. Methods were described in detail in Kelly and Tappen (1998).

For this report, we summarized and presented the winter waterbird data as percent occurrence of each species among years and among surveys, baywide and by sub-area, and as

mean baywide abundances. Detailed analyses of abundance variation and distribution of waterbird species in Tomales Bay were reported by Kelly and Tappen (1998).

Shorebird surveys

Surveys of shorebird species (Scolopacidae, Charadriidae, and Recurvirostridae) were based on counts conducted simultaneously throughout Tomales Bay, within ten sub-areas that together comprise almost all of the intertidal flats in the bay, with the exception of a few small areas at creek mouths along the west shore (Figure 2). Each year from 1989-90 to 2001-2002, we conducted approximately six counts in winter ($\bar{x}$ = 6.2, std. dev. = 0.8) and at least one count during migration periods each fall (late August; $\bar{x}$ = 1.7, std. dev. = 1.0) and spring (late April; $\bar{x}$ = 1.8, std. dev. = 1.0). During each shorebird count, all species in all sub-areas were counted within 60-90 minutes by teams of qualified observers.

Observers counted shorebirds during rising tides, at tide levels between 0.76 and 1.22 m above mean lower low water (MLLW) at Blake's Landing (Figure 2). Sub-area count protocols were coordinated so that adjacent areas were surveyed simultaneously. The time and direction of all flock movements, departures, and arrivals during count periods were recorded and examined later to minimize chances of birds being double counted. Abundances generally represented counts of foraging individuals, with estimates of large mobile flocks made only rarely. Counts were conducted on days with weather favorable for using telescopes to identify shorebirds. See Kelly (2001) for a detailed description of field methods.

As with the waterbird data, we summarized and presented the shorebird data by season (fall, winter, spring), as percent occurrence of each species among years and among surveys, baywide and by sub-area, and as mean baywide abundances. Detailed analyses of abundance variation and distribution of shorebird species in Tomales Bay were reported elsewhere (Kelly 2001).

Species accumulation curves

We estimated the proportion of waterbird and shorebird species detected in the bay during seasonal surveys by evaluating the relationship between count effort (number of counts) and the expected number of species detected. The expected number of species detected was calculated as the mean cumulative number of species detected, based on 100 random samples of counts taken with replacement from the baywide survey data for each level of count effort, weighted equally among all 13 years of data. To evaluate the effectiveness of surveying over a fewer number of years, we recalculated the winter species accumulation curve after limiting each of the 100 samples for each level of count effort to a random selection of five survey years. The resulting species accumulation curves were then inspected visually to determine levels of effort associated with a low probability of detecting additional species.

Scope and sources of documentation

The list of bird species associated with Tomales Bay includes documentation of all bird species known to occur or have occurred in Tomales Bay within boundaries indicated by the mean higher high tide level and the mouth of the bay. Bird species nomenclature and taxonomy follow the 7th edition of the American Ornithologist's Union Checklist of North American Birds, and supplements (A.O.U. 1998; APPENDIX A). We considered the mouth of the bay to be a boundary line that extends approximately perpendicular from the west shore of the bay to the tip of Sand Point (Figure 1). All bird species known to associate with tidal habitats were included on the list. Other species that might occur rarely in Tomales Bay because of their use of suitable adjacent or nearby habitats, and for which tidal habitats in the bay are generally considered to be unsuitable, were not included in the list. These include species such as Brewer's Blackbird (*Euphagus cyanocephalus*), which occasionally occurs along the shore, and Yellow Warbler

(*Dendroica petachia*), which might land or even forage rarely in salt marsh *Grindelia* shrubs (R. Stallcup, pers. observation). Similarly, bird species that only occurred when they by-passed the bay by flying over the area at high-elevations were not included. Occurrences of all other bird species with a potential for interacting with bay habitats were included in the list.

We compiled only records documenting specific observations or occurrences of bird species in Tomales Bay. Records were collected from ornithological journals, government agency reports, published and unpublished survey results, and published and unpublished field notes from field ornithologists. Sources included the "American Birds Notebooks" (cited as ABN), which is the archive of field records accepted by the regional editors (Middle Pacific Coast Region) of *North American Birds* (cited as NAB; formerly *Field Notes*), *Audubon Field Notes* (cited as AFN), and *American Birds* (cited as AB). We also cited specimen records from the California Academy of Sciences (CAS). Numerous unpublished field records were obtained from archives at the Cypress Grove Research Center of Audubon Canyon Ranch, in Marshall (cited as ACR Files). Records of species rare enough to be on the California Bird Records Committee Review List (http://www.wfo-cbrc.org/cbrc/review.html) were included only if accepted by the California Bird Records Committee (CBRC) of Western Field Ornithologists (WFO). We screened all species records for reliability by considering existing descriptive or photographic documentation, existence of specimens, and verification by multiple observers.

We then evaluated the documentation for each species to determine known locations of observations within the bay, relative to the twelve sub-areas indicated in Figure 1. We also evaluated seasonal occurrence, special status categories, preferred habitat (McCaskie et al. 1979), and relative abundance of each species (Table 1). If sub-area location(s) were not known, the species was included in the list but its occurrence within sub-areas was not indicated. Similarly, although sub-area occurrences suggest general patterns of bird use, the actual patterns could be broader if species use areas where they have not yet been detected.

RESULTS AND DISCUSSION

Waterbird surveys

Winter surveys recorded 58 species of “waterbirds” (Tables 2 and 3). These species included three Gaviiformes (loons), six Podicipediformes (grebes), five Pelecaniformes (pelicans and cormorants), four Ciconiiformes (herons), 28 Anseriformes (three geese, 25 ducks), three bay-associated Falconiformes (Peregrine Falcon, Osprey, Northern Harrier), two Gruiformes (American Coot, Common Moorhen), six Charadriiformes (Red-necked Phalarope, Bonaparte’s Gull, Forster’s Tern, three Alcidae; other shorebirds and gulls were not surveyed), and one Coraciiformes (Belted Kingfisher) (Table 2). Cumulative species richness was greatest in the southernmost count area (D) south of Tomasini Point, with 51 species, but reflected species associated with freshwater ponds not included in other count areas (Figure 1, Table 3; Kelly and Tappen 1998). Fifty waterbird species were recorded in the count area (B) from Pelican point to Tom’s Point (Figure 1), which is the area in which species densities were generally greatest (Kelly and Tappen 1998). Overall species richness was greater along the east shore (51 species) than in the mid-bay (48 species) or along the west shore (47 species; Table 3).

The probabilities of species occurrences (indicated by percents in Table 2) do not account for species differences in detectability (conspicuousness or abundance). Percent occurrence calculated among years (based on an average of three surveys per year) is more closely related to a species’ seasonal presence than percent occurrence calculated across all individual counts. Large differences in occurrence calculated among years and counts are likely for species that are difficult to detect or present only for brief periods.

Our estimates of proportions of species likely to be detected by different levels of survey effort was limited slightly because they reflected the chance of detecting only the maximum number of species in existing survey data. However, the species accumulation curve became nearly flat before the observed number of species was detected, suggesting a low likelihood of detecting additional species. Most species were detected after 15-20 baywide counts, with only a few additional species expected with additional effort (Figure 3). Such new species typically represent rare visitors or vagrant species that do not normally occur in the bay. Most species were also detected if the 15-20 baywide counts were conducted within a five-year period, although some rare species were likely to be missed (Figure 3).

We emphasize that the species accumulation curves are based on methods that involved approximately three counts each winter. Repeated surveys are necessary each year to achieve adequate precision for monitoring annual species abundances (Kelly and Tappen 1998). However the presence of most species observed in a given year was detected during the first two counts; the cumulative number of species did not increase significantly (0-3 additional species) after the second count (early January) within survey years (Bonferroni post-hoc comparisons, $P > 0.26$). Additional winter counts increase the detectability of rare species and late-winter arrivals and improve the precision of abundance estimates. However, because of annual differences in species occurrences, extending a given number of counts over more years is likely to result in greater cumulative species richness than concentrating samples over fewer years.

Shorebird surveys

Seasonal surveys recorded 32 species of shorebirds (Tables 4 and 5). Cumulative species richness was greatest in count areas at Sand Point (28 species) and Walker Creek delta (26 species; Table 5). Comparisons between count areas differing in areal extent may reflect the influence of species-area relationships on habitat quality, as well as differences in the suitability

or diversity of foraging substrates. Differences in the quality or diversity of foraging substrates, relative to their suitability for more species and independent of species-area effects, can be inferred from our results only if a smaller habitat patch supports more species than a larger one. For example, the foraging substrates in count area 3 are associated with more shorebird species than substrates in larger areas 5, 7, 8 and 10. However, the smaller sizes of count areas 4, 6, or 8 might account for fewer species found in those areas (see Figure 1 for areal extents of count areas). Overall species richness was slightly less in fall than in winter or spring (Table 5).

As with waterbirds, the probabilities of species occurrences (Table 4) do not account for species differences in detectability (conspicuousness or abundance). Percent occurrence calculated among years (based on repeated counts) is more closely related to seasonal presence than percent occurrence calculated across all individual counts. Large differences in occurrence among years and counts are likely for species that are difficult to detect or present only for brief periods.

Shorebird species accumulation curves leveled off before the observed number of species was detected (Figure 4). During winter, most species were detected after 20 baywide counts, although the mean number of species detected continued to increase slightly up to 100 counts before leveling off. When we limited each iteration of count effort to five randomly selected survey years, most wintering species were detected after 20 counts but species richness was lower even at high levels of count effort because rare species (singleton records) were often missed (Figure 4). Such new species typically represent rare visitors or vagrant species that do not normally occur in the bay.

As with waterbirds, we emphasize that the estimated number of shorebird species detected for a given level of effort is based on the survey methods used, which involved an average of 6.2 ± 0.8 (std. dev.) counts each winter. Repeated winter surveys were necessary to achieve adequate precision for monitoring annual changes in winter abundances (Kelly 2001).

However, the presence of most shorebird species observed in a given winter was detected during early winter; the cumulative number of wintering species did not increase significantly after the third count (December) within survey years (Bonferroni post-hoc comparisons, $P > 0.50$). The species accumulation curve suggested that three to four surveys per year for five years might be needed to account for normally occurring species (Figure 4). Annual differences in the occurrences of rare wintering species further suggest that extending a given number of winter counts over more years should result in greater cumulative species richness than concentrating samples over fewer years. Based on these results, the number of wintering shorebird species normally or occasionally occurring in Tomales Bay could be evaluated reasonably by 20-30 baywide winter counts conducted over five years, but a more thorough assessment of winter shorebird species occurrence may require at least three surveys per year for ten or more years.

Fall and spring migration surveys detected most species after 20 counts (mean = 1.7 ± 1.0 yr^{-1} in fall, 1.8 ± 1.0 yr^{-1} in spring; Figure 4). Fall and spring surveys did not attempt to precisely measure variation in species abundances. Repeated surveys within fall and spring seasons are likely to improve estimates of species richness (as well as species abundances), because species occurrences can vary considerably with the timing of migratory movements through the area. Therefore, most species present during migration periods might be detectable by conducting at least 20 counts over a shorter period of monitoring, such as 5-10 years, but this suggestion cannot be verified by our data.

Documented bird species occurrences

A comprehensive list of bird species indicated that 163 species are known to occur or have occurred in Tomales Bay below the mean higher high tide level (Table 6). These included 122 species that occur regularly or occasionally and 41 species that occur with less than five documented occurrences. Mute Swan (*Cygnus olor*) was observed at Bivalve and Millerton

Gulch on 30 April, 1992 (ACR Files), and has bred in Marin County since 1984 (R. Stallcup, unpubl.), but it was not included in the list because it is a feral species (A.O.U. 1998) and not included on the list of California bird species by the CBRC. Common Shelduck (*Tadorna tadorna*) was present at Walker Creek delta in March and April, 1992 (ACR Files), but is not considered to have an established population (A.O.U. 1998) and is not recognized by the CBRC; therefore is was not included in the list.

New species expected to be observed

One of us (Stallcup) generated the following list of additional species that are likely to occur in Tomales Bay and to be detected in the near future. The list was based on a review of documented species occurrences elsewhere in California and along the Pacific Coast, based on published accounts and accepted records from the CBRC. Because of substantial existing information on Tomales Bay birds, such species are likely to represent difficult-to-observe pelagic visitors, species with expanding ranges, and rare species that have been observed elsewhere along this part of the Pacific Coast.

Arctic Loon (*Gavia arctica*). This species is the result of a recent split of the former "Arctic Loon" into two species, Arctic Loon and Pacific Loon (*Gavia pacifica*). Arctic Loon has been identified at Abbott's Lagoon; at North Beach in the Point Reyes National Seashore; off Bodega Head in Sonoma County; and inside Bodega Harbor. All of these sightings occurred within the last six years. The number of records is likely increase as birders and ornithologists learn how to identify this species.

Northern Fulmar (*Fulmaris glacialis*). Fulmars are abundant offshore in late fall and winter. Many infirm individuals swim to the mainland to die. The lack of documented records of this species inside Tomales Bay is surprising.

Steller's Eider (*Polysticta stelleri*). This species has been recorded in Crescent City Harbor (one bird), Humboldt Bay (two birds), and Bodega Harbor (one bird). It is likely that this species will eventually be detected among the thousands of other divers and waterbirds that occur in Tomales Bay during Pacific herring runs.

Wilson's Phalarope (*Phalaropus tricolor*). This species is a regular fall and spring migrant (in small numbers) along the coast of Marin County. It prefers fresh water, salt ponds and alkali lakes, but they also often occur in brackish tidal habitat. A record for Tomales Bay from Brazil Beach, Walker Creek, or Bivalve would be no surprise.

Sabine's Gull (*Xema sabini*). Hundreds or thousands of Sabine's Gulls pass from 10-50 miles offshore of Marin County during fall and spring. Many records exist for onshore lakes and esteros in California, so occasional passing migrants should be expected over or on Tomales Bay.

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Table 1. Categories and symbols used to summarize existing information on bird species of Tomales Bay (Table 6).

Seasonal Status:
- W = Mostly winter
- M = Fall and or spring migrant
- S = Mostly summer
- R = Resident; present all year
- L = Local visitor from nearby habitat areas
- * = Known to nest or have nested in the area

Special status:
- FE = Federally listed as Endangered
- FT = Federally listed as Threatened
- FSC = Federal Special Concern species (former Category 2 candidates)
- FD = Federally delisted (monitoring)
- BMC = Migratory Nongame Birds of Management Concern, U.S. Fish and Wildlife Service
- SE = State-listed as Endangered
- ST = State-listed as Threatened
- CSC = California Special Concern species, State Department of Fish and Game
- WL = Audubon Watch List for California
- PIF = Partners in Flight Watch List

Preferred habitat (based on McCaskie et al. 1979):
- OB = Open water of bays or estuaries
- OC = Outer coastal water, nearshore or pelagic
- M = Mudflat and shallowly flooded areas free of upright vegetation
- FM = Freshwater marsh or ponds
- SM = Saltmarsh
- R = Rocky shore
- C = Cliff or other steep rocky areas lacking vegetation
- B = Sandy beach
- G = Grassland, including pastures, fields, meadows, and savannah
- S = Shrubland in relatively dry areas
- r = Riparian vegetation or creek channel
- F = Forest, trees closely spaced; non-riparian
- W = Woodland, trees widely spaced; non-riparian
- A = Aerial; associated with strong flying species often seen overhead

Relative abundance
- A = Abundant; >100 individuals observed per day in appropriate habitat and season
- C = Common; 10-100 individuals observed per day in appropriate habitat and season
- UC = Uncommon; <10 individuals observed per day in appropriate habitat and season
- R = Rare; Observed every year but not seen daily in appropriate habitat and season
- Cs = Casual; not observed every year, very unlikely to be seen
- X = Extremely rare; < 5 records overall

Table 2. Percent occurrence of waterbird species in Tomales Bay, 1989-90 to 2001-02, among years (n = 13) and among counts (n=39, weighted equally among years). Baywide abundances reflect means and standard errors of baywide counts, weighted equally among years; see Kelly and Tappen (1998) for detailed analysis of abundance variation. See Figure 1 for locations of count areas; see APPENDIX A for species names.

		Count areas																	
Species	Sample units	AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	All areas	Baywide abundance mean (SE)[a]
COLO	years	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	77	92	77	**100**	100	
	counts	100	98	98	**100**	97	100	100	**100**	100	100	100	**100**	55	74	58	**92**	100	191 (4.8)
PALO	years	62	62	92	**92**	46	85	100	**100**	92	100	92	**100**	15	46	46	**77**	100	
	counts	26	34	50	**71**	20	59	62	**84**	52	96	67	**96**	6	27	13	**39**	100	92 (10.8)
RTLO	years	85	85	77	**92**	85	100	92	**100**	100	100	92	**100**	77	77	62	**85**	100	
	counts	59	65	39	**76**	65	87	79	**95**	86	97	92	**100**	31	52	31	**69**	100	145 (8.5)
HOGR	years	100	100	85	**100**	100	100	100	**100**	100	100	100	**100**	92	92	85	**100**	100	
	counts	95	97	74	**100**	100	100	100	**100**	100	100	100	**100**	63	75	57	**96**	100	556 (24.5)
EAGR	years	92	100	85	**100**	92	100	92	**100**	100	100	100	**100**	54	77	69	**100**	100	
	counts	72	86	58	**97**	86	100	92	**100**	97	100	95	**100**	28	46	38	**80**	100	325 (15.2)
WEGR	years	69	54	69	**85**	100	92	100	**100**	100	100	100	**100**	100	92	100	**100**	100	
	counts	41	27	37	**67**	90	80	93	**97**	100	100	100	**100**	97	86	96	**100**	100	526 (28.6)
CLGR	years	38	31	31	**69**	77	69	69	**85**	100	100	100	**100**	100	92	69	**100**	100	
	counts	16	14	10	**31**	57	31	42	**690**	91	93	94	**100**	81	85	39	**97**	100	90 (6.7)

Table 2. (continued)

Species	Sample units	Count areas																All areas	Baywide abundance mean (SE)[a]
		AE	AM	AW	**A**	BE	BM	BW	**B**	CE	CM	CW	**C**	DE	DM	DW	**D**		
RNGR	years	46	100	92	**100**	31	92	92	**92**	42	92	62	**92**	31	23	8	**46**	100	
	counts	22	80	82	**97**	12	80	84	**87**	19	56	32	**700**	10	7	2	**17**	100	27 (1.8)
PBGR	years	31	15	0	**31**	62	77	69	**100**	77	23	46	**77**	69	8	38	**69**	100	
	counts	10	5	0	**12**	42	52	29	**73**	43	14	24	**58**	38	2	14	**42**	81	8 (0.9)
AMWP	years	8	8	0	**15**	23	23	0	**38**	15	0	0	**15**	0	0	0	**0**	46	
	counts	2	3	0	**4**	14	8	0	**21**	5	0	0	**4**	0	0	0	**0**	25	7 (1.9)
BRPE	years	69	62	38	**77**	77	92	62	**92**	85	85	85	**92**	46	54	62	**77**	100	
	counts	31	38	17	**44**	38	53	38	**59**	59	53	42	**70**	19	24	42	**52**	78	31 (4.3)
DCCO	years	85	100	46	**100**	100	100	100	**100**	100	100	100	**100**	100	85	77	**100**	100	
	counts	57	92	22	**97**	94	96	83	**100**	100	96	95	**100**	87	73	43	**100**	100	518 (25.5)
BRCO	years	54	100	100	**100**	31	85	100	**100**	92	100	85	**100**	8	15	0	**23**	100	
	counts	24	70	77	**87**	11	71	88	**100**	54	79	67	**93**	4	4	0	**8**	100	107 (12.1)
PECO	years	38	69	92	**92**	38	85	100	**100**	85	54	69	**100**	8	15	0	**15**	100	
	counts	25	39	63	**86**	16	45	83	**94**	56	31	40	**79**	2	6	0	**8**	100	13 (1.1)
GBHE	years	62	31	69	**92**	92	23	92	**100**	69	8	92	**92**	77	23	46	**100**	100	
	counts	27	10	29	**44**	65	8	56	**84**	46	2	62	**72**	47	6	23	**72**	100	10 (0.7)
GREG	years	38	8	0	**46**	92	8	31	**92**	77	15	69	**100**	92	8	62	**100**	100	
	counts	14	4	0	**18**	76	4	17	**82**	59	5	33	**78**	83	4	49	**90**	97	11 (0.7)

Table 2. (continued)

Species	Sample units	Count areas: AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	All areas	Baywide abundance mean (SE)
SNEG	years	62	0	8	**62**	85	8	85	**92**	85	8	69	**85**	46	8	38	**62**	100	
	counts	32	0	4	**32**	48	2	35	**69**	35	2	42	**54**	24	30	20	**33**	87	6 (0.5)
BCNH	years	0	0	0	**0**	0	0	0	**0**	0	0	8	**8**	0	0	15	**15**	23	
	counts	0	0	0	**0**	0	0	0	**0**	0	0	2	**2**	0	0	6	**6**	8	+ (0.8)
CAGO	years	0	8	0	**8**	8	8	0	**15**	0	0	0	**0**	31	0	0	**31**	38	
	counts	0	4	0	**4**	2	4	0	**6**	0	0	0	**0**	8	0	0	**8**	14	4 (1.1)
ROGO	years	0	0	0	**0**	0	8	0	**8**	0	0	0	**0**	0	0	0	**0**	8	
	counts	0	0	0	**0**	0	2	0	**2**	0	0	0	**0**	0	0	0	**0**	3	+ (0.01)
BRAN	years	77	85	54	**100**	100	100	92	**100**	38	85	77	**85**	8	15	8	**23**	100	
	counts	61	65	24	**81**	69	95	82	**97**	11	61	33	**67**	4	6	3	**8**	100	1357 (65.1)
MALL	years	15	8	0	**15**	38	23	8	**62**	23	15	8	**31**	85	8	15	**85**	100	
	counts	4	2	0	**4**	17	6	2	**24**	6	4	2	**10**	51	3	4	**53**	65	12 (2.3)
GADW	years	0	0	0	**0**	8	0	0	**8**	0	0	0	**0**	92	0	0	**92**	92	
	counts	0	0	0	**0**	2	0	0	**2**	0	0	0	**0**	76	0	0	**76**	76	38 (3.2)
NOPI	years	23	31	8	**46**	46	54	15	**69**	0	54	0	**54**	100	8	23	**100**	100	
	counts	6	10	2	**15**	30	30	6	**48**	0	22	0	**22**	81	3	12	**85**	91	105 (14.3)
GWTE	years	15	8	8	**31**	0	31	8	**31**	8	8	0	**15**	92	0	8	**92**	100	
	counts	6	2	2	**10**	0	8	2	**8**	4	3	0	**6**	52	0	4	**52**	58	18 (2.6)

Table 2. (continued)

Species	Sample units	Count areas																All areas	Baywide abundance mean (SE)[a]
		AE	AM	AW	**A**	BE	BM	BW	**B**	CE	CM	CW	**C**	DE	DM	DW	**D**		
CITE	years	0	0	0	**0**	0	0	0	**0**	0	8	0	**8**	8	0	0	**8**	8	
	counts	0	0	0	**0**	0	0	0	**0**	0	2	0	**2**	2	0	0	**2**	4	+ (0.04)
AMWI	years	38	23	8	**46**	92	85	85	**92**	38	46	85	**92**	92	8	23	**92**	100	
	counts	13	9	2	**19**	54	53	48	**79**	25	22	44	**57**	83	2	12	**83**	97	251 (22.7)
EUWI	years	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	46	0	0	**46**	46	
	counts	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	18	0	0	**18**	18	+ (0.05)
NOSH	years	15	23	8	**23**	23	23	0	**31**	8	15	0	**15**	46	0	0	**46**	61	
	counts	4	8	3	**8**	8	8	0	**14**	3	5	0	**4**	16	0	0	**16**	30	8 (2.8)
REHE	years	8	8	0	**15**	62	54	0	**77**	0	0	0	**0**	15	0	0	**15**	77	
	counts	2	2	0	**4**	27	22	0	**45**	0	0	0	**0**	4	0	0	**4**	49	4 (0.7)
CANV	years	8	0	0	**8**	8	23	0	**31**	8	8	0	**15**	54	0	0	**54**	62	
	counts	3	0	0	**3**	3	6	0	**9**	3	3	0	**5**	21	0	0	**21**	32	7 (2.5)
RNDU	years	0	0	0	**0**	0	0	0	**0**	8	8	0	**15**	69	8	8	**69**	69	
	counts	0	0	0	**0**	0	0	0	**0**	2	3	0	**4**	38	3	3	**40**	42	2 (0.3)
GRSC	years	77	54	15	**85**	92	92	38	**92**	100	100	100	**100**	100	100	100	**100**	100	
	counts	55	26	6	**63**	76	64	20	**79**	91	95	87	**100**	93	80	85	**97**	100	3505 (294.3)
LESC	years	15	23	8	**38**	23	8	15	**38**	31	54	38	**85**	92	8	38	**92**	92	
	counts	4	6	4	**14**	6	2	6	**14**	10	22	15	**38**	71	2	15	**74**	78	76 (10.0)

Table 2. (continued)

Species	Sample units	Count areas																All areas	Baywide abundance mean (SE)[a]
		AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D		
COGO	years	100	92	92	**100**	100	100	100	**100**	100	69	100	**100**	92	31	54	**92**	100	
	counts	83	85	76	**100**	96	95	93	**100**	88	41	97	**97**	52	13	19	**71**	100	99 (5.5)
BAGO	years	8	0	0	**8**	23	0	8	**31**	8	8	8	**23**	0	0	0	**0**	17	
	counts	2	0	0	**2**	8	0	4	**10**	4	2	2	**8**	0	0	0	**0**	17	0.5 (0.2)
BUFF	years	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	100	
	counts	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	100	178.6 (9.4)
HADU	years	0	0	0	**0**	8	8	0	**15**	0	0	8	**8**	0	0	0	**0**	23	
	counts	0	0	0	**0**	3	2	0	**4**	0	0	2	**2**	0	0	0	**0**	6	+ (0.05)
WWSC	years	62	69	15	**85**	62	92	23	**100**	54	62	31	**77**	23	15	8	**38**	100	
	counts	42	44	7	**65**	38	73	13	**85**	38	49	16	**65**	8	6	4	**18**	91	18 (1.6)
SUSC	years	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	100	100	100	**100**	100	
	counts	98	100	98	**100**	100	100	100	**100**	100	98	100	**100**	90	92	96	**100**	100	5913 (182.9)
BLSC	years	23	69	0	**77**	37	77	31	**92**	100	100	92	**100**	46	46	0	**69**	100	
	counts	6	32	0	**36**	19	53	13	**75**	97	92	70	**100**	22	24	0	**40**	100	75 (3.9)
LTDU	years	0	0	15	**15**	0	31	38	**62**	23	15	15	**38**	8	8	15	**15**	77	
	counts	0	0	10	**10**	0	8	18	**26**	8	4	4	**13**	2	2	10	**10**	44	1 (0.2)
RUDU	years	77	31	15	**77**	100	92	62	**100**	100	85	77	**100**	100	85	100	**100**	100	
	counts	48	10	4	**55**	95	72	32	**97**	95	43	35	**100**	100	49	85	**100**	100	1198 (58.2)

Table 2. (continued)

Species	Sample units	Count areas																All areas	Baywide abundance mean (SE)[a]
		AE	AM	AW	**A**	BE	BM	BW	**B**	CE	CM	CW	**C**	DE	DM	DW	**D**		
HOME	years	0	0	0	**0**	8	0	0	**8**	0	0	0	**0**	23	0	0	**23**	31	
	counts	0	0	0	**0**	2	0	0	**2**	0	0	0	**0**	14	0	0	**14**	16	+ (0.08)
RBME	years	85	100	100	**100**	69	100	100	**100**	100	100	100	**100**	92	85	54	**92**	100	
	counts	67	97	96	**100**	53	93	97	**97**	88	94	98	**100**	58	54	29	**69**	100	91 (4.2)
COME	years	8	31	23	**54**	54	38	15	**77**	38	31	15	**54**	31	0	0	**31**	85	
	counts	8	14	6	**26**	25	12	6	**40**	19	13	4	**29**	8	0	0	**8**	59	4 (0.8)
OSPR	years	23	0	8	**31**	54	23	31	**69**	0	0	38	**38**	38	15	31	**54**	69	
	counts	10	0	2	**12**	33	6	8	**40**	0	0	15	**15**	15	4	13	**28**	61	2 (0.2)
PEFA	years	15	8	15	**23**	15	15	8	**23**	0	8	8	**8**	46	8	0	**46**	62	
	counts	6	3	4	**10**	4	4	2	**10**	0	3	3	**3**	17	4	0	**17**	31	1 (0.1)
NOHA	years	8	0	0	**8**	0	0	0	**0**	0	0	0	**0**	23	0	0	**23**	23	
	counts	4	0	0	**4**	0	0	0	**0**	0	0	0	**0**	8	0	0	**8**	12	+ (0.04)
COMO	years	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	15	0	0	**15**	15	
	counts	0	0	0	**0**	0	0	0	**0**	0	0	0	**0**	6	0	0	**6**	6	+ (0.02)
AMCO	years	77	31	0	**85**	100	54	77	**100**	100	8	69	**100**	92	31	100	**100**	100	
	counts	60	12	0	**62**	97	28	48	**100**	92	3	44	**93**	87	13	94	**97**	100	645 (44.2)
REPH	years	23	8	8	**23**	15	31	15	**38**	23	15	23	**23**	15	8	8	**23**	46	
	counts	10	4	3	**10**	6	14	6	**16**	10	10	14	**14**	6	4	2	**8**	22	56 (25.5)

Table 2. (continued)

Species	Sample units	Count areas: AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	All areas	Baywide abundance mean (SE)[a]
BOGU	years	0	0	0	**0**	0	0	0	**0**	38	31	46	**77**	15	8	8	**23**	85	
	counts	0	0	0	**0**	0	0	0	**0**	20	17	21	**40**	4	3	4	**8**	42	2 (0.3)
FOTE	years	54	31	8	**62**	77	46	8	**77**	85	85	23	**100**	69	62	31	**85**	100	
	counts	24	10	3	**28**	44	16	3	**48**	52	44	14	**63**	40	33	15	**53**	78	33 (3.1)
COMU	years	0	0	15	**15**	8	15	0	**23**	15	31	15	**46**	0	0	0	**0**	62	
	counts	0	0	4	**4**	2	4	0	**6**	6	10	6	**17**	0	0	0	**0**	23	+ (0.06)
RHAU	years	0	0	0	**0**	0	8	8	**15**	0	0	0	**0**	0	0	0	**0**	15	
	counts	0	0	0	**0**	0	2	3	**4**	0	0	0	**0**	0	0	0	**0**	4	+ (0.02)
CAAU	years	0	0	0	**0**	0	0	0	**0**	0	0	8	**8**	0	0	0	**0**	8	
	counts	0	0	0	**0**	0	0	0	**0**	0	0	2	**2**	0	0	0	**0**	2	+ (0.01)
BEKI[a]	years[a]	25	0	75	**75**	50	0	100	**100**	100	0	50	**100**	50	0	75	**75**	100	
	counts[a]	13	0	33	**40**	29	0	50	**60**	51	0	38	**73**	33	0	27	**48**	87	4 (0.9)

[a]Belted Kingfisher counts began in December, 1999 ($n_{years} = 4$; $n_{counts} = 13$).

Table 3. Species richness of Tomales Bay waterbirds based on survey data, 1989-90 to 2001-01. See Figure 1 for locations of count areas and sub-areas.

Count areas	East shore (E)	Mid-bay (M)	West shore (W)	**All sub-areas**
Sand Point to Tom's Point (A)	43	38	35	**46**
Tom's Point to Pelican Point (B)	46	46	40	**50**
Pelican Point to Tomasini Point (C)	42	43	40	**49**
South of Tomasini Point (D)	50	37	36	**51**
All count areas	**51**	**48**	**47**	**58**

Table 4. Percent occurrence of shorebird species in Tomales Bay, 1989-90 to 2001-02, in fall migration (F), winter (W), and spring migration (S), among years (n_{fall} = 12; n_{winter} = 13; n_{spring} = 13) and among counts (n_{fall} = 20; n_{winter} = 80; n_{spring} = 23). Baywide abundances reflect means and standard errors of baywide counts, weighted equally among years; see Kelly (2001) for detailed analysis of abundance variation. See Figure 2 for locations of count areas: see APPENDIX A for species names.

			Count areas											
Species	Season	Sample units	1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
BBPL	fall	years	0	25	100	58	83	92	50	42	0	0	100	
		counts	0	35	100	50	90	90	45	30	0	0	100	106 (9.4)
	winter	years	46	83	100	92	100	85	100	100	0	15	100	
		counts	22	34	91	59	59	57	74	92	0	03	99	137 (9.0)
	spring	years	0	17	100	67	62	54	54	77	0	8	100	
		counts	0	15	100	77	61	61	48	78	0	4	100	58 (5.2)
PAGP	fall	years	0	8	25	0	0	0	0	0	0	0	33	
		counts	0	10	15	0	0	0	0	0	0	0	25	+ (0.2)
	winter	years	0	83	38	0	0	0	0	0	0	0	100	
		counts	0	50	19	0	0	0	0	0	0	0	61	3 (0.4)
	spring	years	0	42	23	0	0	0	0	0	0	0	62	
		counts	0	25	17	0	0	0	0	0	0	0	39	1 (0.3)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
AMGP	fall	years	0	33	0	0	0	0	0	0	0	0	33	
		counts	0	30	0	0	0	0	0	0	0	0	30	1 (0.4)
	winter	years	0	15	0	0	0	0	0	0	0	0	15	
		counts	0	3	0	0	0	0	0	0	0	0	3	+ (0.03)
	spring	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
GOPL	fall	years	0	42	25	0	0	0	0	0	0	0	67	
		counts	0	45	15	0	0	0	0	0	0	0	60	3 (0.5)
	winter	years	0	92	38	0	0	0	0	0	0	0	100	
		counts	0	53	19	0	0	0	0	0	0	0	64	3 (0.4)
	spring	years	0	58	23	0	0	0	0	0	0	0	77	
		counts	0	40	17	0	0	0	0	0	0	0	52	2 (0.4)
SNPL	fall	years	0	0	50	0	17	0	0	0	0	0	58	
		counts	0	0	45	0	10	0	0	0	0	0	55	6 (1.5)
	winter	years	0	0	100	0	0	8	8	0	0	0	100	
		counts	0	0	50	0	0	1	1	0	0	0	50	15 (2.5)
	spring	years	0	0	38	0	8	8	8	0	0	0	54	
		counts	0	0	22	0	4	4	4	0	0	0	35	2 (0.5)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
SEPL	fall	years	17	8	75	67	92	67	67	75	0	8	100	
		counts	15	5	85	40	75	45	80	60	0	5	100	44 (6.5)
	winter	years	8	8	77	31	62	92	100	69	0	23	100	
		counts	1	1	40	6	11	38	44	30	0	4	76	18 (2.6)
	spring	years	23	17	92	58	100	38	69	62	0	0	100	
		counts	13	10	74	36	87	22	61	43	0	0	96	86 (10.8)
KILL	fall	years	17	67	67	25	25	50	17	50	0	0	100	
		counts	10	65	60	15	15	50	15	40	0	0	100	7 (0.9)
	winter	years	38	100	69	46	54	62	85	92	30	54	100	
		counts	16	86	26	10	15	32	43	25	11	20	95	15 (1.9)
	spring	years	23	92	46	42	8	15	62	62	33	15	100	
		counts	13	70	35	23	4	9	48	39	25	13	91	7 (0.8)
BLOY	fall	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
	winter	years	8	0	0	0	0	0	0	0	0	0	8	
		counts	1	0	0	0	0	0	0	0	0	0	1	+ (0.04)
	spring	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
AMAV	fall	years	0	0	8	0	8	0	0	8	0	0	25	
		counts	0	0	5	0	5	0	0	5	0	0	15	1 (0.4)
	winter	years	0	0	0	0	0	0	0	31	10	8	38	
		counts	0	0	0	0	0	0	0	5	2	1	8	+ (0.07)
	spring	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
GRYE	fall	years	8	0	25	8	58	50	83	92	0	17	100	
		counts	5	0	15	5	60	35	85	70	0	10	95	12 (1.3)
	winter	years	23	42	31	38	92	62	100	100	60	31	100	
		counts	5	7	6	8	39	18	42	83	16	11	84	11 (1.4)
	spring	years	8	50	31	0	77	8	46	92	44	8	100	
		counts	4	30	17	0	61	4	30	87	33	4	100	16 (1.6)
LEYE	fall	years	17	0	17	0	0	8	8	25	0	0	50	
		counts	10	0	10	0	0	10	5	15	0	0	40	1 (0.2)
	winter	years	0	0	0	0	0	15	15	8	0	0	38	
		counts	0	0	0	0	0	3	3	1	0	0	6	+ (0.03)
	spring	years	0	0	0	0	0	0	8	23	11	0	31	
		counts	0	0	0	0	0	0	4	17	8	0	22	1 (0.4)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
WILL	fall	years	100	8	100	100	100	100	83	58	0	75	100	
		counts	95	5	100	100	100	100	90	50	0	70	100	549 (23.7)
	winter	years	100	83	100	100	100	92	100	100	10	100	100	
		counts	88	37	91	87	99	68	86	94	2	91	100	381 (15.8)
	spring	years	85	25	92	100	100	85	77	92	11	77	100	
		counts	83	15	96	91	91	78	61	83	8	70	100	209 (26.0)
WATA	fall	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
	winter	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
	spring	years	0	0	0	0	0	0	8	0	0	0	8	
		counts	0	0	0	0	0	0	4	0	0	0	4	+ (0.05)
SPSA	fall	years	0	0	0	0	0	67	50	0	0	0	75	
		counts	0	0	0	0	0	50	45	0	0	0	70	2 (0.4)
	winter	years	23	0	0	0	31	100	92	0	0	23	100	
		counts	7	0	0	0	5	81	35	0	0	4	89	2 (0.2)
	spring	years	0	0	8	0	15	69	46	8	0	15	85	
		counts	0	0	4	0	9	57	30	4	0	9	74	2 (0.4)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
WHIM	fall	years	50	8	50	42	25	8	0	17	0	0	75	
		counts	50	10	35	35	15	5	0	10	0	0	80	2 (0.5)
	winter	years	69	0	31	46	8	15	23	15	0	8	92	
		counts	24	0	5	14	3	3	4	3	0	1	45	1 (0.2)
	spring	years	62	25	54	25	69	69	54	23	0	0	92	
		counts	61	16	35	14	74	52	35	13	0	0	96	7 (0.9)
LBCU	fall	years	0	0	17	0	42	0	8	8	0	0	58	
		counts	0	0	10	0	25	0	5	5	0	0	40	2 (0.7)
	winter	years	0	0	8	0	15	8	8	38	0	15	62	
		counts	0	0	1	0	5	1	1	16	0	3	25	+ (0.08)
	spring	years	0	0	23	0	31	0	15	8	0	0	54	
		counts	0	0	17	0	17	0	9	4	0	0	39	1 (0.2)
MAGO	fall	years	83	0	100	100	100	100	75	58	0	42	100	
		counts	90	0	100	100	100	95	85	55	0	35	100	1474 (149.8)
	winter	years	100	92	100	100	100	77	100	100	0	100	100	
		counts	68	43	91	83	94	36	73	95	0	82	100	865 (55.8)
	spring	years	100	58	100	100	92	100	100	100	22	85	100	
		counts	100	40	100	100	96	87	100	83	17	17	100	1315 (85.8)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
RUTU	fall	years	8	0	25	42	25	17	8	0	0	0	57	
		counts	5	0	15	25	20	10	5	0	0	0	50	2 (0.8)
	winter	years	8	0	31	38	54	46	31	8	0	0	77	
		counts	1	0	10	8	14	14	8	1	0	0	41	2 (0.5)
	spring	years	0	0	15	17	54	62	54	15	0	0	77	
		counts	0	0	13	9	57	61	43	9	0	0	87	6 (1.2)
BLTU	fall	years	0	0	42	58	58	42	25	8	0	0	83	
		counts	0	0	40	50	65	55	25	5	0	0	90	20 (4.4)
	winter	years	23	8	54	92	92	92	92	31	0	0	100	
		counts	5	1	12	40	56	44	60	10	0	0	90	42 (3.9)
	spring	years	0	0	23	58	46	69	69	31	0	0	85	
		counts	0	0	13	45	48	61	70	22	0	0	91	34 (7.0)
SURF	fall	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
	winter	years	0	0	8	0	0	15	8	0	0	0	23	
		counts	0	0	1	0	0	3	1	0	0	0	5	+ (0.04)
	spring	years	0	0	0	0	15	31	31	0	0	0	38	
		counts	0	0	0	0	9	26	22	0	0	0	35	7 (3.6)

Table 4. (continued)

Species	Season	Sample units	Percent occurrence by count area 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
REKN	fall	years	0	0	75	0	33	0	0	0	0	0	75	
		counts	0	0	65	0	20	0	0	0	0	0	70	4 (0.7)
	winter	years	0	0	46	8	0	0	0	8	0	0	54	
		counts	0	0	19	4	0	0	0	1	0	0	21	2 (0.6)
	spring	years	0	0	62	17	31	8	0	23	0	0	69	
		counts	0	0	48	9	17	4	0	13	0	0	74	8 (1.6)
SAND	fall	years	0	0	100	58	83	0	0	17	0	0	100	
		counts	0	0	100	35	75	0	0	10	0	0	100	419 (51.1)
	winter	years	100	17	100	100	100	100	92	100	0	92	100	
		counts	62	3	99	95	94	78	57	81	0	28	100	587 (30.4)
	spring	years	23	0	100	33	54	62	23	23	0	8	100	
		counts	13	0	91	27	39	35	17	13	0	4	96	396 (75.0)
WESA	fall	years	75	8	100	100	92	58	100	67	0	0	100	
		counts	75	5	100	100	95	35	100	75	0	0	100	1993 (220.1)
	winter	years	62	33	100	100	100	69	100	100	0	23	100	
		counts	28	6	65	73	92	22	59	79	0	5	100	1357 (102.1)
	spring	years	69	8	100	92	100	23	85	77	22	31	100	
		counts	43	5	91	82	100	17	74	65	17	26	100	1802 (217.4)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
LESA	fall	years	75	8	67	92	100	42	100	92	0	0	100	
		counts	65	5	80	80	100	35	95	90	0	0	100	824 (134.3)
	winter	years	100	75	100	100	100	92	100	100	10	31	100	
		counts	77	27	68	74	89	49	74	74	2	7	98	804 (82.1)
	spring	years	62	8	100	67	85	38	85	69	45	15	100	
		counts	48	5	74	73	87	22	74	61	33	13	100	281 (50.6)
BASA	fall	years	0	0	8	8	8	0	0	0	0	0	25	
		counts	0	0	5	5	5	0	0	0	0	0	15	1 (0.3)
	winter	years	0	0	0	0	0	8	0	0	0	0	8	
		counts	0	0	0	0	0	1	0	0	0	0	1	+ (0.01)
	spring	years	0	0	0	0	8	0	0	0	0	0	8	
		counts	0	0	0	0	4	0	0	0	0	0	4	+ (0.05)
DUNL	fall	years	8	0	8	0	17	8	0	8	0	0	42	
		counts	5	0	5	0	15	5	0	5	0	0	30	1 (0.4)
	winter	years	45	75	100	100	100	85	100	100	20	54	100	
		counts	24	20	95	81	94	44	69	90	4	16	100	3461 (363.7)
	spring	years	8	0	100	92	100	46	69	77	11	15	100	
		counts	5	0	96	91	100	39	52	78	8	9	100	901 (144.0)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
SBDO	fall	years	0	0	42	8	33	0	0	0	0	0	58	
		counts	0	0	35	5	30	0	0	0	0	0	55	13 (4.9)
	winter	years	0	0	23	8	23	23	8	15	0	0	54	
		counts	0	0	5	1	5	4	1	3	0	0	14	3 (1.4)
	spring	years	8	0	54	0	38	0	8	38	0	0	92	
		counts	5	0	30	0	22	0	4	26	0	0	78	35 (10.7)
LBDO	fall	years	0	0	17	8	17	0	8	0	0	0	42	
		counts	0	0	10	5	15	0	5	0	0	0	35	3 (1.9)
	winter	years	0	17	15	0	15	31	8	31	0	0	85	
		counts	0	6	6	0	4	5	1	5	0	0	23	5 (3.0)
	spring	years	0	8	8	8	8	0	0	8	0	0	38	
		counts	0	5	4	5	4	0	0	4	0	0	22	2 (1.4)
DOWI	fall	years	0	0	92	83	83	8	50	58	0	17	100	
		counts	0	0	75	70	90	5	50	23	0	10	95	215 (39.0)
	winter	years	8	25	62	46	77	62	77	100	40	23	100	
		counts	3	9	18	17	37	25	21	28	7	4	73	46 (6.9)
	spring	years	46	17	77	58	92	31	46	92	44	23	100	
		counts	32	10	50	45	96	17	43	74	42	13	100	316 (34.0)

Table 4. (continued)

Species	Season	Sample units	Count areas 1	2	3	4	5	6	7	8	9	10	All areas	Baywide abundance mean (SE)[a]
WISN	fall	years	0	8	0	0	0	25	0	0	0	0	25	
		counts	0	5	0	0	0	15	0	0	0	0	15	+ (0.3)
	winter	years	8	92	38	38	23	31	0	8	30	0	92	
		counts	1	51	13	10	4	6	0	1	7	0	69	8 (1.7)
	spring	years	8	42	0	0	0	0	0	0	11	0	46	
		counts	5	25	0	0	0	0	0	0	8	0	30	+ (0.1)
RNPH	fall	years	0	0	25	17	33	33	8	42	0	0	67	
		counts	0	0	15	10	20	20	5	30	0	0	50	17 (7.9)
	winter	years	0	0	0	8	0	0	0	0	0	0	8	
		counts	0	0	0	1	0	0	0	0	0	0	1	+ (0.05)
	spring	years	0	0	8	8	8	0	8	8	0	0	15	
		counts	0	0	4	5	4	0	4	4	0	0	9	+ (0.3)
REPH	fall	years	0	0	0	0	0	0	0	0	0	0	0	
		counts	0	0	0	0	0	0	0	0	0	0	0	0 (0.0)
	winter	years	0	8	0	0	0	0	0	0	0	0	8	
		counts	0	1	0	0	0	0	0	0	0	0	1	+ (0.04)
	spring	years	0	0	0	8	8	0	8	0	11	0	8	
		counts	0	0	0	5	4	0	4	0	8	0	4	1 (0.3)

Table 5. Species richness of Tomales Bay shorebirds based on seasonal survey data, 1989-90 to 2001-01. See Figure 2 for locations of count areas.

Count areas	Fall	Winter	Spring	**All seasons**
1	11	16	13	**19**
2	9	16	12	**19**
3	23	21	21	**28**
4	16	18	16	**21**
5	21	18	23	**26**
6	16	22	17	**25**
7	15	20	22	**24**
8	15	20	20	**23**
9	1	8	10	**12**
10	4	14	10	**15**
All count areas	**26**	**28**	**28**	**32**

Table 6. Documented bird species occurrences on Tomales Bay prior to December, 2002. "X" indicates documented species presence in a sub-area; blank indicates that data are insufficient to determine species presence in a sub-area. See Figure 1 for sub-area locations; see Table 1 for legend of symbols used.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Yellow-billed Loon	W		OB	Cs					X			X	X			X			X	X	CBRC; APPENDIX B
Common Loon	W	CSC,BMC	OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Pacific Loon	W		OC,OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Red-throated Loon	W		OC,OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Horned Grebe	W		OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Eared Grebe	W		OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Red-necked Grebe	W		OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Western Grebe	W		OC,OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Clark's Grebe	W		OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Pied-billed Grebe	R*		OB,FM	U	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Sooty Shearwater	LM		OC	X														X		X	APPENDIX B
Fork-tailed Storm-Petrel	LR	CSC	OC	X						X		X	X			X					APPENDIX B
Ashy Storm-Petrel	LR	FSC,CSC,BMC	OC	X													X			X	APPENDIX B
Red-footed Booby	S			X		X		X													CBRC; APPENDIX B
American White Pelican	S	CSC,WL	OB	C	X	X		X	X	X		X	X			X	X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Brown Pelican	S	FE,SE,BMC	OC,OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Double-crested Cormorant	R*	CSC	OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Brandt's Cormorant	R		OC,OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	Kelly and Tappen 1998; J. Kelly, unpubl.
Pelagic Cormorant	R		OC,OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	Kelly and Tappen 1998; J. Kelly, unpubl.
Magnificent Frigatebird	S		A	X										X		X		X		X	APPENDIX B
American Bittern	R	FSC	FM	X					X			X									Regular but uncommon in adjacent habitat; APPENDIX B
Great Blue Heron	R*	BMC	M,FM,SM	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Great Egret	R*		M,FM,SM	C	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Snowy Egret	R	FSC,CSC	M,FM,SM	U	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Little Blue Heron	S		M,FM,SM	X					X			X	X			X					APPENDIX B
Black-crowned Night-Heron	R*	FSC	M,FM,SM	U									X			X					ACR Files; J. Kelly, unpubl.
Turkey Vulture	R*		A	C	X			X	X		X	X	X			X					ACR Files
Ross's Goose	W		FM,G	Cs	X			X		X		X								X	Kelly and Tappen 1998; J. Kelly, unpubl.; APPENDIX B
Emperor Goose	W		FM,M,G	X																X	CBRC; APPENDIX B
Snow Goose	W		FM.G	X	X			X													Uncommon visitor in area; APPENDIX B
Greater White-fronted Goose	W		FM,G	X										X		X					APPENDIX B
Canada Goose	W*		FM.G	U	X	X		X	X	X		X					X			X	Resident in area; Kelly and Tappen 1998; J. Kelly, unpubl.
Cackling Canada Goose	W		FM.G	X	X			X													R. Stallcup, unpubl.
Aleutian Canada Goose	W	FT	FM.G	X						X		X									ACR Files; J. Kelly, unpubl.
(Black) Brant	W		OB,SM	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
(American) Brant	W		OB,SM	X	X			X	X			X									APPENDIX B
Tundra Swan	W		G	Cs	X			X									X			X	APPENDIX B
Mallard	W		FM,SM	U	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Gadwall	W		FM,SM	R					X			X					X			X	Kelly and Tappen 1998; J. Kelly, unpubl.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Northern Pintail	W		FM,SM	U	X	X	X	X	X	X	X	X		X		X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Green-winged Teal	W		FM,SM	R	X	X	X	X	X	X	X	X	X	X		X	X		X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Cinnamon Teal	R*		FM	R										X		X	X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Blue-winged Teal	W		FM	X	X			X													ACR Files; APPENDIX B
American Wigeon	W		OB,FM	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Eurasian Wigeon	W		OB,FM	Cs							X	X					X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Northern Shoveler	W		FM	U	X	X	X	X	X	X		X					X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Redhead	W		OB,FM	R	X	X		X	X	X		X					X			X	Kelly and Tappen 1998; J. Kelly, unpubl.; R. Stallcup, unpubl.
Canvasback	W		FM	R	X			X	X	X		X					X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Ring-necked Duck	W		FM	R									X	X		X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Greater Scaup	W		OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Lesser Scaup	W		OB,FM	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Tufted Duck	W		OB,FM	X									X			X			X	X	APPENDIX B
Common Goldeneye	W		OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Barrow's Goldeneye	W	CSC,WL	OB	Cs	X			X	X		X	X	X	X	X	X	X			X	Kelly and Tappen 1998; ACR Files; J. Kelly, unpubl.
Bufflehead	W		OB,FM	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Harlequin Duck	W	FSC, CSC	OB,OC	Cs					X	X		X	X		X	X					Kelly and Tappen 1998; J. Kelly, unpubl.; APPENDIX B
White-winged Scoter	W		OB	R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Surf Scoter	W		OC,OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Black Scoter	W		OB	C	X	X		X	X	X	X	X	X	X	X	X	X	X		X	Kelly and Tappen 1998; J. Kelly, unpubl.
Long-tailed Duck	W		OB	Cs			X	X		X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; ACR Files; J. Kelly, unpubl.
Ruddy Duck	W		OB,FM	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Hooded Merganser	W		FM,r	Cs					X			X					X			X	Kelly and Tappen 1998; J. Kelly, unpubl.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Red-breasted Merganser	W		OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Common Merganser	W		r	R	X	X	X	X	X	X	X	X	X	X	X	X	X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
King Eider	W		OC,OB	X				X													CBRC; APPENDIX B
Osprey	R*	CSC	OB	U	X		X	X	X	X	X	X			X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Bald Eagle	W	FT,SE	OB,FM	X					X		X	X				X	X			X	Casual in area; R. Stallcup, unpubl.
Northern Harrier	R*	CSC	G,SM,FM	U	X			X	X		X	X	X			X	X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Red-shourldered Hawk	LR*		r,F,W	U																	R. Stallcup, unpubl.
Red-tailed Hawk	LR*		G,W,A	U																	R. Stallcup, unpubl.
Peregrine Falcon	W		OB, M	U	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Peregrine Falcon (anatum)	W	FD,SE, BMC	OB, M	X					X			X									R. Stallcup, unpubl.; J. Kelly, pers. observation
Prairie Falcon	W	CSC,WL	G	R					X			X									ACR Files; R. Stallcup, unpubl.
Merlin	W	CSC	M,A	R					X			X					X		X	X	Kelly and Tappen 1998; J. Kelly, unpubl.; R. Stallcup, unpubl.
Common Moorhen	W*		FM	Cs													X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
American Coot	W*		OB,FM	A	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Virginia Rail	W*		FM,SM	U															X	X	ACR Files
Sora	W		FM	R																X	R. Stallcup, unpubl.
California Clapper Rail	W*	FE,ST	SM	X															X	X	CBRC; APPENDIX B
Black Rail	R*	ST,FSC,PIF	FM,SM	R															X	X	Evens and Page 1986; R. Stallcup, unpubl.; Jules Evens, unpubl.
Yellow Rail	W	CSC,BMC,WL,PIF	FM,SM	X															X	X	CBRC;Shuford et. al. 1989;Av. Res. Assoc. 2002;Stallcup,unpubl.
Black-bellied Plover	W		M,A	C	X			X	X		X	X	X			X	X		X	X	Kelly 2001; J. Kelly, unpubl.
American Golden-Plover	M		G	Cs	X			X													Kelly 2001; J. Kelly, unpubl.; R. Stallcup, unpubl.
Pacific Golden-Plover	W		G	Cs	X			X													Kelly 2001; J. Kelly, unpubl.
Golden-plover species	WM		G	R	X			X													Kelly 2001; J. Kelly, unpubl.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																	Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D		
Western Snowy Plover	W	FT,CSC,BMC,PIF	B,M	U	X			X	X			X	X			X						Kelly 2001; J. Kelly, unpubl.
Semipalmated Plover	WM		M	C	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Killdeer	R*		M,G	U	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Black Oystercatcher	R*	PIF,WL	R	R						X	X	X										Kelly 2001; ACR Files; J. Kelly, unpubl.
American Avocet	W		M,SM	Cs	X			X	X			X					X		X	X		Kelly 2001; J. Kelly, unpubl.
Greater Yellowlegs	W		M,SM	C	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Lesser Yellowlegs	M		FM,SM	R	X			X			X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Willet	W		M,SM	A	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Solitary Sandpiper	M		FM	X																X		R. Stallcup, unpubl.; APPENDIX B
Wandering Tattler	W		R	X					X			X	X			X						Kelly 2001; J. Kelly, unpubl.
Spotted Sandpiper	W		R	U	X			X	X		X	X	X			X			X	X		Kelly 2001; J. Kelly, unpubl.
Whimbrel	W		M,B,SM	R	X			X	X		X	X	X			X			X	X		Kelly 2001; J. Kelly, unpubl.
Long-billed Curlew	W	CSC,WL,BMC,PIF	M,SM	R	X			X	X			X	X			X			X	X		Kelly 2001; J. Kelly, unpubl.
Marbled Godwit	W		M	A	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Ruddy Turnstone	W		R	R	X			X	X		X	X	X			X				X		Kelly 2001; J. Kelly, unpubl.
Black Turnstone	W		R	U	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Surfbird	M		R	R	X			X	X			X	X			X						Kelly 2001; J. Kelly, unpubl.
Red Knot	M		B,M	R	X			X	X			X	X			X				X		Kelly 2001; J. Kelly, unpubl.
Sanderling	W		B,M	A	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Western Sandpiper	W		M	A	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.
Semipalmated Sandpiper	M		M	X	X			X	X			X										APPENDIX B; ABN; J. Kelly, unpubl.; R. Stallcup, unpubl.
Stilt Sandpiper	M		M	X															X	X		ABN; APPENDIX B; R. Stallcup, unpubl.
Least Sandpiper	W		M	A	X			X	X		X	X	X			X	X		X	X		Kelly 2001; J. Kelly, unpubl.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Baird's Sandpiper	M		FM,M	R	X			X	X			X	X			X					Kelly 2001; J. Kelly, unpubl.
Pectoral Sandpiper	M		FM	X					X			X									Brazil Beach, July 1994; ACR Files; J. Kelly, unpubl.
Dunlin	W		M	A	X			X	X		X	X	X			X	X		X	X	Kelly 2001; J. Kelly, unpubl.
Ruff	W		SM,FM	X					X			X									APPENDIX B
Short-billed Dowitcher	M		M,SM	C	X			X	X		X	X	X			X			X	X	Kelly 2001; J. Kelly, unpubl.
Long-billed Dowitcher	W		M,FM,SM	C	X			X	X			X	X			X			X	X	Kelly 2001; J. Kelly, unpubl.
Dowitcher species	WM		M,FM,SM	C	X			X	X		X	X	X			X	X		X	X	Kelly 2001; J. Kelly, unpubl.
Wilson's Snipe	W		G	U	X			X	X		X	X	X			X			X	X	Kelly 2001; J. Kelly, unpubl.
Red-necked Phalarope	M		FM,OB	R	X			X	X			X	X			X	X		X	X	Kelly 2001; J. Kelly, unpubl.
Red Phalarope	LM		OC, OB	Cs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly 2001; Kelly and Tappen 1998; J. Kelly, unpubl..
Parasitic Jaeger	M		OC,OB	UC	X	X		X	X			X	X	X		X					ACR Files; J. Kelly, unpubl.; Stallcup, unpubl.
Franklin's Gull	M		B,M,OB	X						X		X	X			X					ABN; ACR Files; J. Kelly, unpubl; Dave Shuford, unpubl.).
Laughing Gull	M	CSC	B,M,OB	X									X			X					APPENDIX B; AFN; R. Stallcup, photos.
Black-headed Gull	M		OB	X						X		X		X		X					CBRC; APPENDIX B; ABN; R. Stallcup, unpubl.
Little Gull	M		OB	X															X	X	CBRC; APPENDIX B; AFN 1984; R. Stallcup, unpubl.
Bonaparte's Gull	M		OB	R	X	X	X	X	X	X	X	X	X			X	X			X	Kelly and Tappen 1998; J. Kelly, unpubl.
Heermann's Gull	S		OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	J. Kelly, unpubl., R. Stallcup, unpubl.
Mew Gull	W		OB	UC	X			X	X			X	X	X	X	X	X	X		X	Kelly et al 1996; CBC; J. Kelly, unpubl.; R. Stallcup, unpubl.
Ring-billed Gull	R		B,M,OB	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly et al 1996; CBC; J. Kelly, unpubl.; R. Stallcup, unpubl.
California Gull	W	CSC	B,M,OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly et al 1996; CBC; J. Kelly, unpubl.; R. Stallcup, unpubl.
Herring Gull	W		B,M,OB	UC			X	X		X	X	X		X	X	X			X	X	CBC; J. Kelly, unpubl., R. Stallcup, unpubl.
Thayer's Gull	W		B,M,OB	R	X			X			X	X	X			X					CBC; R. Stallcup, unpubl.; J. Kelly, unpubl.
Western Gull	R*		B,M,OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly et al 1996; CBC; J. Kelly, unpubl.; R. Stallcup, unpubl.

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Glaucous-winged Gull	W		B,M,OB	A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly et al 1996; CBC; J. Kelly, unpubl.; R. Stallcup, unpubl.
Glaucous Gull	W		B,M,OB	X					X			X					X			X	ABN; CBC; R. Stallcup, unpubl.; J. Kelly unpubl.
Black-legged Kittiwake	LW		OC	X	X			X								X					ACR Files; R. Stallcup, unpub.; J. Kelly, unpubl.
Caspian Tern	S		B,M,OB	C	X			X	X			X	X			X			X	X	ACR Files; J. Kelly, unpubl.
Royal Tern	W		B,OB	X																	APPENDIX B; Grinnel and Wythe 1927; Grinnel and Miller 1944
Elegant Tern	S	FSC,CSC,BMC	OB	C	X	X		X	X	X		X	X	X		X					ACR Files; J. Kelly, unpubl.; R. Stallcup, unpubl.
Common Tern	M		OB	Cs	X			X	X	X		X	X			X					ACR Files; J. Kelly, unpubl.; R. Stallcup, unpubl.
Arctic Tern	LM		OC	X	X			X													APPENDIX B; ACR Files; R. Stallcup, unpubl.;J. Kelly, unpubl.
Forster's Tern	R	WL	OB	UC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Kelly and Tappen 1998; ACR Files; J. Kelly, unpubl.
California Least Tern	M	FE,SE,BMC	OB	X					X			X									APPENDIX B; ABN
Black Tern	M	FSC,CSC,BMC	FM,SM,G	X																X	APPENDIX B; R. Stallcup, unpubl.
Black Skimmer	S	CSC,WL,BMC,PIF	OB	X					X			X									APPENDIX B; AFN 1994
Common Murre	LR		OC,OB	R			X	X	X	X		X	X	X	X	X			X	X	Kelly and Tappen 1998; J. Kelly, unpubl.; R. Stallcup, unpubl.
Pigeon Guillemot	LS		OC	X						X		X									ACR Files; J. Kelly, unpubl.
Marbled Murrelet	LR	FT,SE,BMC	OC	X				X													APPENDIX B
Rhinoceros Auklet	LR	CSC	OC	X						X	X	X									Kelly and Tappen 1998; ACR Files; J. Kelly, unpubl.
Cassin's Auklet	LR		OC	X											X	X					Kelly and Tappen 1998; J. Kelly, unpubl.
Barn Owl	LR*		G,W,r	R					X			X									ACR Files; J. Kelly, unpubl.
Great-horned Owl	LR*	CSC,WL,BMC,PIF	G,W,r,F	R					X			X	X			X					ACR Files; J. Kelly, unpubl.
Short-eared Owl	W	FSC,CSC,WL,BMC	FM,SM,G	X					X			X									ACR Files; J. Kelly, unpubl.
Belted Kingfisher	R*		C,OB	U	X		X	X	X		X	X	X		X	X	X		X	X	Kelly and Tappen 1998; J. Kelly, unpubl.
Black Phoebe	R*		F,M,r	U									X			X					ACR Files; J. Kelly, unpubl.
American Crow	R*		G,r,W	C									X			X			X	X	Kelly et al. 2002; ACR Files

Species	Seasonal status	Special status	Preferred habitat	Relative abundance	Occurrence by sub-area																Distribution notes and data sources
					AE	AM	AW	A	BE	BM	BW	B	CE	CM	CW	C	DE	DM	DW	D	
Common Raven	R*		G,W	C	X			X	X			X	X		X	X	X		X	X	Kelly et al. 2002; ACR Files
Horned Lark	W*	CSC	G	R	X			X													R. Stallcup, unpubl.
Marsh Wren	R*		FM,SM	U									X			X			X	X	ACR Files; J. Kelly, unpubl.; R. Stallcup, unpubl.
American Pipit	W		G,SM,FM,B	U	X			X	X			X	X			X					ACR Files
Loggerhead Shrike	W	FSC,CSC,BMC,WL	G,W	X																X	APPENDIX B
Northern Shrike	W		G,W	X																X	APPENDIX B
Saltmarsh Common Yellowthroa	R*	FSC,CSC,	FM, SM	U							X	X	X		X	X			X	X	J. Kelly, unpubl.; R. Stallcup, unpubl.
Savannah Sparrow	R		G,SM	C	X			X	X		X	X	X		X	X	X		X	X	J. Kelly, unpubl.; R. Stallcup, unpubl.
Nelson's Sharp-tailed Sparrow	W		SM	X																X	APPENDIX B; ABN
Song Sparrow	R		r,FM,S	C	X			X	X		X	X	X		X	X	X		X	X	Chan and Arcese 2002; J. Kelly, unpubl.; R. Stallcup, unpubl.
Swamp Sparrow	W		FM	R									X			X			X	X	J. Kelly, unpubl.; R. Stallcup, unpubl.
Lincoln's Sparrow	W		S,r,G	U															X	X	J. Kelly, unpubl.; R. Stallcup, unpubl.
Golden-crowned Sparrow	W		S,G	C	X			X	X			X	X			X			X	X	J. Kelly, unpubl.
White-crowned Sparrow	R*		S,G	C	X			X	X			X	X			X			X	X	J. Kelly, unpubl.
Western Meadowlark	W*		G,SM	U	X			X	X			X								X	ACR Files; J. Kelly, unpubl.

Table 7. Shorebird species detected in baywide surveys on Tomales Bay, 1989-2002 (Kelly 2002). "X" indicates documented species presence in a sub-area; blank indicates that data are insufficient to determine species presence in a sub-area. See Figure 2 for sub-area locations.

	Sub-areas in Tomales Bay									
Species	1	2	3	4	5	6	7	8	9	10
Black-bellied Plover	X	X	X	X	X	X	X	X		X
American Golden-Plover		X								
Pacific Golden-Plover		X	X							
Golden-plover species		X	X							
Snowy Plover			X		X	X	X			
Semipalmated Plover	X	X	X	X	X	X	X	X		X
Killdeer	X	X	X	X	X	X	X	X	X	X
Black Oystercatcher	X									
American Avocet			X		X			X	X	X
Greater Yellowlegs	X	X	X	X	X	X	X	X	X	X
Lesser Yellowlegs	X		X			X	X	X	X	
Willet	X	X	X	X	X	X	X	X	X	X
Wandering Tattler							X			
Spotted Sandpiper	X		X		X	X	X	X		X
Whimbrel	X	X	X	X	X	X	X	X		X
Long-billed Curlew			X		X	X	X	X		X
Marbled Godwit	X	X	X	X	X	X	X	X	X	X
Ruddy Turnstone	X		X	X	X	X	X	X		
Black Turnstone	X	X	X	X	X	X	X	X		

Table 7. Shorebird species detected in baywide surveys on Tomales Bay, 1989-2002 (Kelly 2002). See Figure 2 for sub-area locations. (continued)

	Sub-areas in Tomales Bay									
Species	1	2	3	4	5	6	7	8	9	10
Surfbird			X		X	X	X			
Red Knot			X	X	X	X		X		
Sanderling	X	X	X	X	X	X	X	X		X
Western Sandpiper	X	X	X	X	X	X	X	X	X	X
Semipalmated Sandpiper										X
Least Sandpiper	X	X	X	X	X	X	X	X	X	X
Baird's Sandpiper			X	X	X	X				
Dunlin	X	X	X	X	X	X	X	X	X	X
Short-billed Dowitcher	X		X	X	X	X	X	X		
Long-billed Dowitcher		X	X	X	X	X	X	X		
Dowitcher species	X	X	X	X	X	X	X	X	X	X
Wilson's Snipe	X	X	X	X	X	X		X	X	
Red-necked Phalarope			X	X	X	X	X	X		
Red Phalarope		X		X	X		X		X	

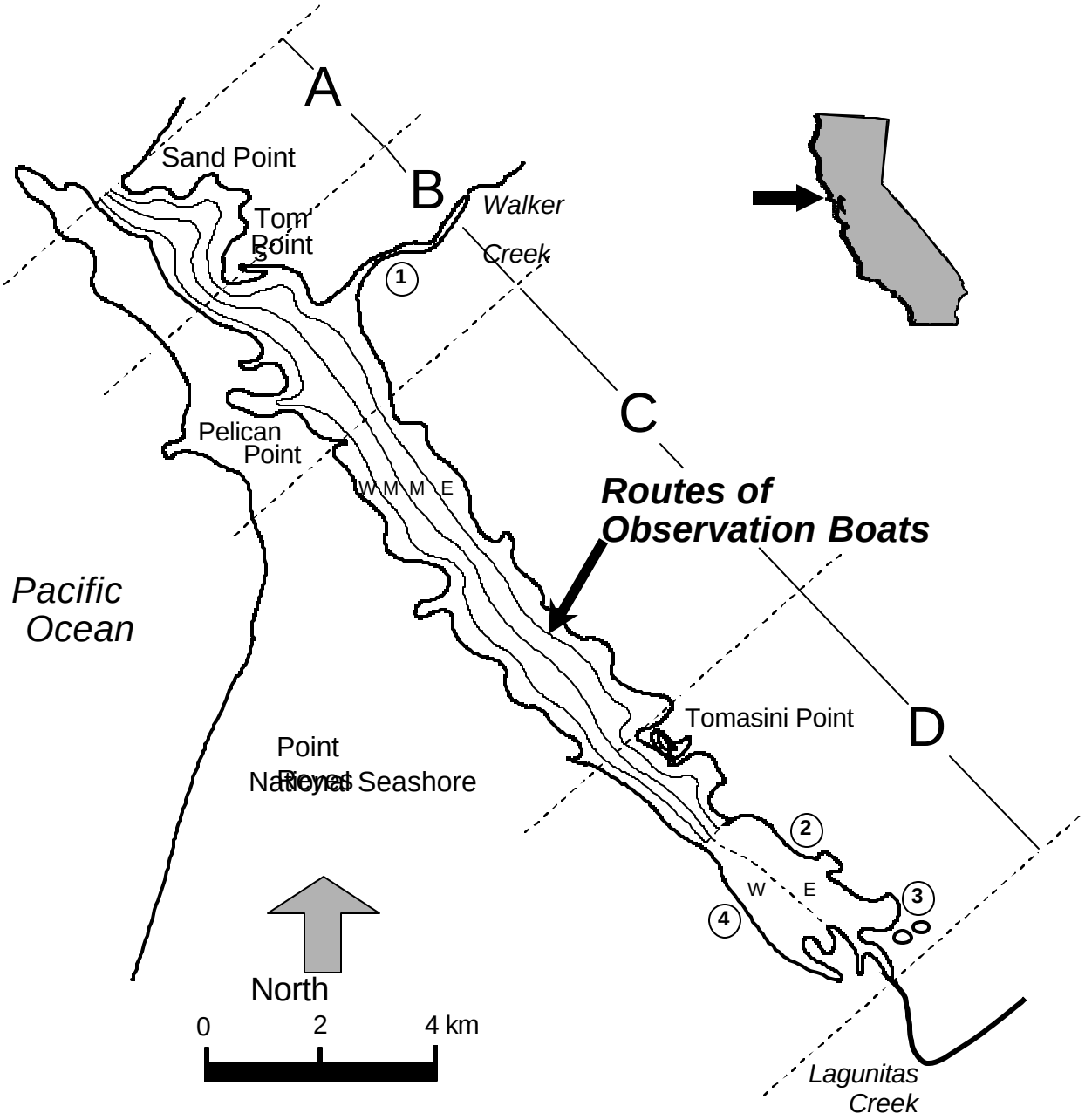


Figure 1. Winter waterbird count areas (A, B, C, D) on Tomales Bay; sub-areas marked by routes of observation boats along west shore (W), mid-bay (M), and east shore (E); and supplementary counting points (circled) at Walker Creek (1), Millerton Gulch to Bivalve (2), Bivalve (3), and Inverness (4).

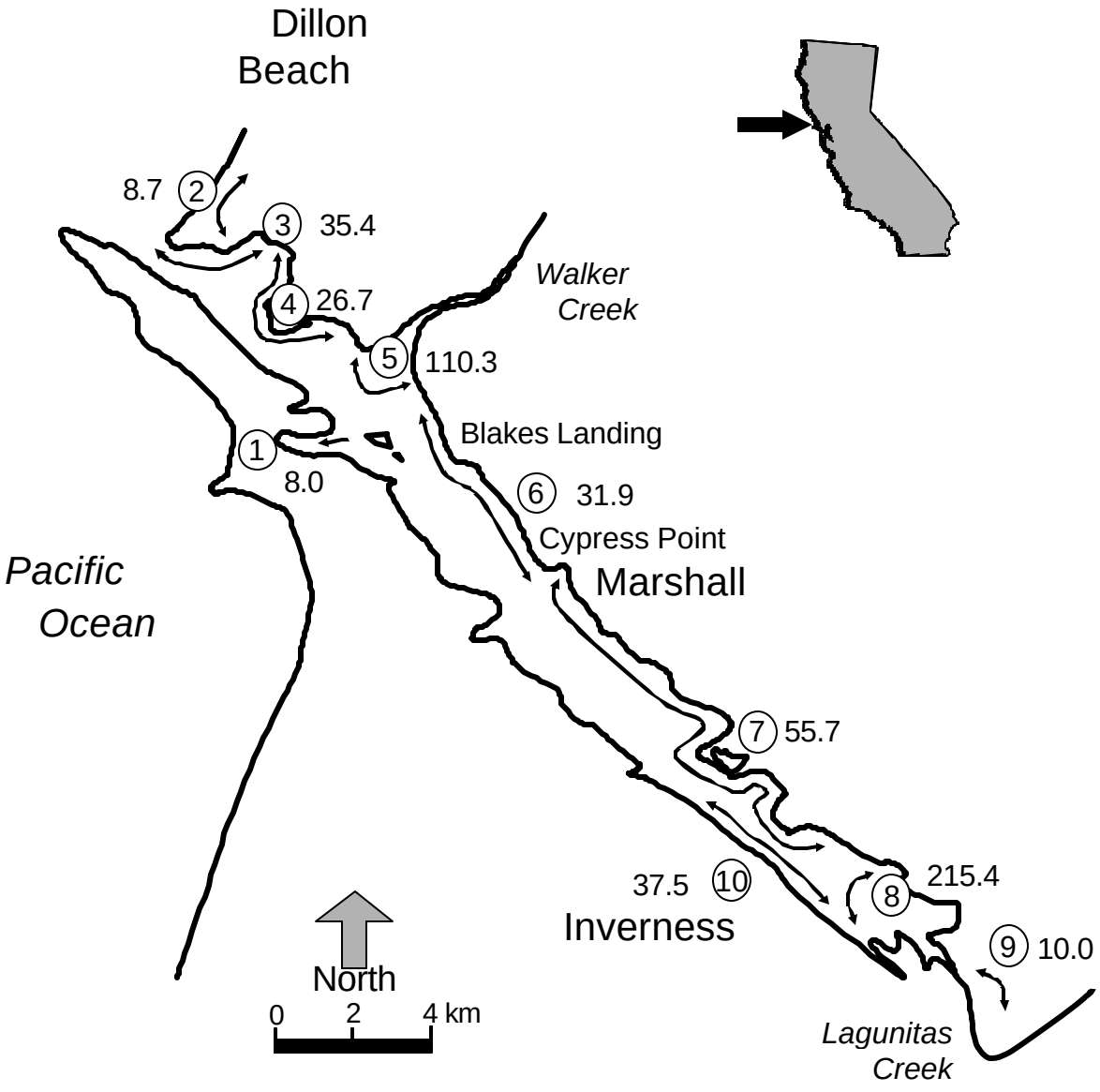


Figure 2. Shorebird count areas on Tomales Bay, California. 1, White Gulch; 2, Lawson's Meadow (seasonal wetlands); 3, Sand Point (end of sand spit to cattle fence at east end of dunes; 4, Tom's Point (cattle fence at north end of Brazil Beach, mud flats on south side of Tom's Point); 5, Walker Creek delta; 6, North Marshall (Miller Park to Cypress Point); 7, South Marshall (Marshall cove to Millerton Gulch); 8, Lagunitas Creek delta (incl. Bivalve, east of railroad levee); 9, Giacomini Pasture (seasonal wetlands); 10, Inverness shoreline. Arrows indicate length of shoreline in each count area; labels indicate the extent (ha) of exposed tidal flat at MLLW.

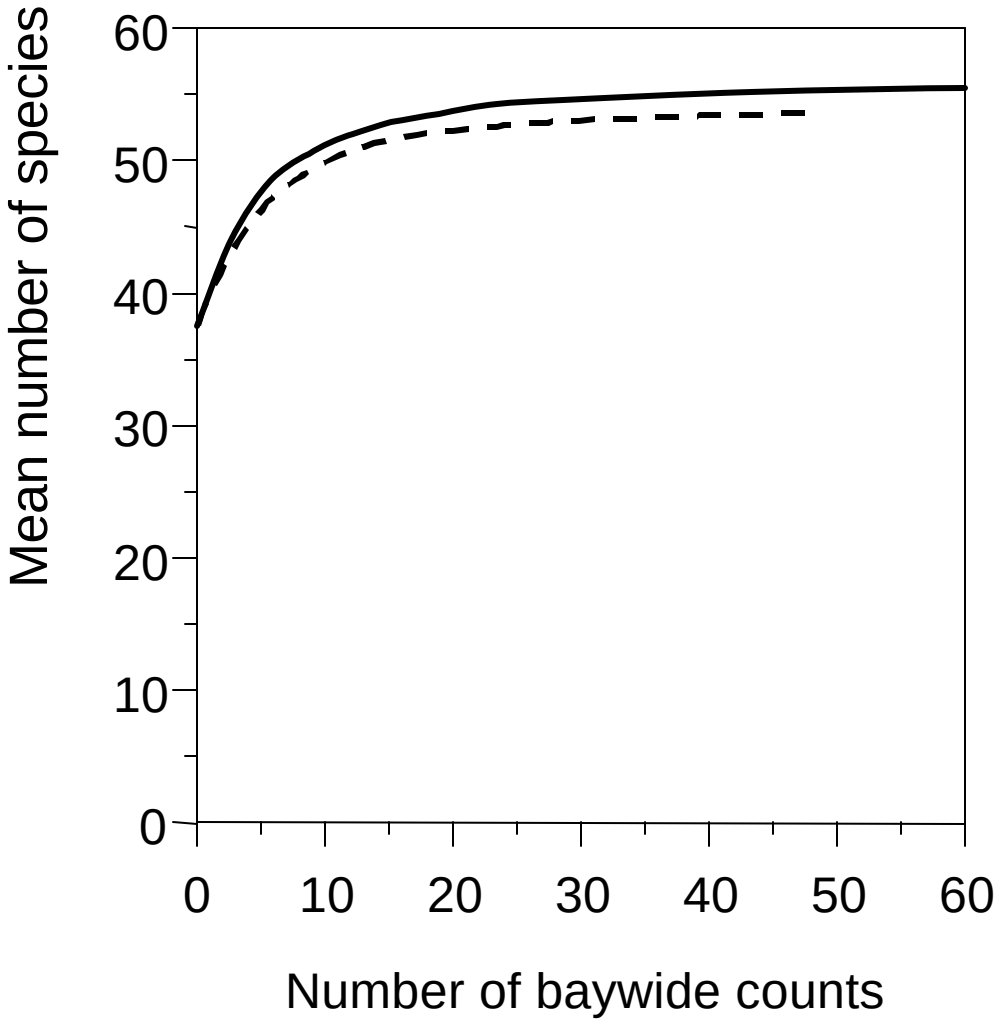


Figure 3. Species accumulation curve indicating the expected (mean) number of winter waterbird species detected by varying levels of count effort in Tomales Bay, California, 1989-2002. The mean number of species for each level of effort is based on 100 random samples taken with replacement from 13 years of baywide waterbird count data (n=39, solid line; dashed line: each sample limited to random selection of five years).

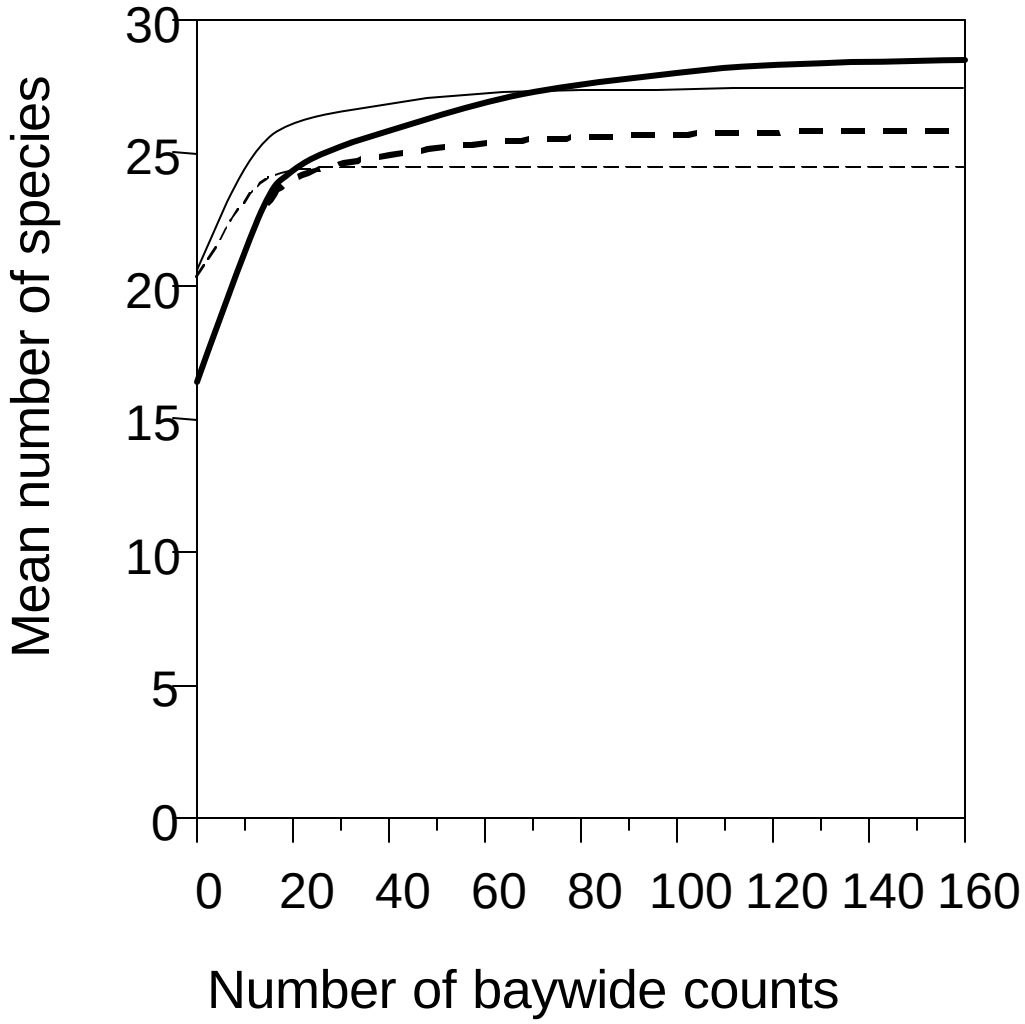


Figure 4. Species accumulation curves indicating the expected (mean) number of shorebird species detected by varying levels of count effort, base on surveys conducted in Tomales Bay, California, 1989-2002. The mean number of species for each level of effort is based on 100 random samples taken with replacement from 13 years of shorebird count data in fall migration (n=20, thin solid line), winter (n=80, bold solid line; bold dashed line: each sample limited to random selection of five years), and spring migration (n=23, thin dashed line).

APPENDIX A: Taxonomy of bird species of Tomales Bay (A.O.U. 1998 and supplements).

Common name	Code	Order	Family	Scientific name
Yellow-billed Loon	YBLO	Gaviiformes	Gaviidae	*Gavia adamsii*
Common Loon	COLO	Gaviiformes	Gaviidae	*Gavia immer*
Pacific Loon	PALO	Gaviiformes	Gaviidae	*Gavia pacifica*
Red-throated Loon	RTLO	Gaviiformes	Gaviidae	*Gavia stellata*
Horned Grebe	HOGR	Podicipediformes	Podicipedidae	*Podiceps auritus*
Eared Grebe	EAGR	Podicipediformes	Podicipedidae	*Podicps nigricollis*
Red-necked Grebe	RNGR	Podicipediformes	Podicipedidae	*Podiceps grisegena*
Western Grebe	WEGR	Podicipediformes	Podicipedidae	*Aechmophorus occidentalis*
Clark's Grebe	CLGR	Podicipediformes	Podicipedidae	*Aechmophorus clarkii*
Pied-billed Grebe	PBGR	Podicipediformes	Podicipedidae	*Podilymbus podiceps*
Sooty Shearwater	SOSH	Procillariiformes	Procillariidae	*Puffinus griseus*
Fork-tailed Storm-Petrel	FTSP	Procillariiformes	Hydrobatidae	*Oceanodroma furcata*
Ashy Storm-Petrel	ASSP	Procillariiformes	Hydrobatidae	*Oceanodroma homochroa*
Red-footed Booby	RFBO	Pelecaniformes	Sulidae	*Sula sula*
American White Pelican	AWPE	Pelecaniformes	Pelecanidae	*Pelecanus erythrorhynchos*
Brown Pelican	BRPE	Pelecaniformes	Pelecanidae	*Pelecanus occidentalis*
Double-crested Cormorant	DCCO	Pelecaniformes	Phalacrocoracidae	*Phalacrtocorax auritus*
Brandt's Cormorant	BRCO	Pelecaniformes	Phalacrocoracidae	*Phalacrtocorax penicillatus*
Pelagic Cormorant	PECO	Pelecaniformes	Phalacrocoracidae	*Phalacrtocorax pelagicus*
Magnificent Frigatebird	MAFR	Pelecaniformes	Fregatidae	*Fregata magnificens*
American Bittern	AMBI	Ciconiiformes	Ardeidae	*Botaurus lentiginosus*
Great Blue Heron	GBHE	Ciconiiformes	Ardeidae	*Ardea herodias*
Great Egret	GREG	Ciconiiformes	Ardeidae	*Ardea alba*
Snowy Egret	SNEG	Ciconiiformes	Ardeidae	*Egretta thula*
Little Blue Heron	LBHE	Ciconiiformes	Ardeidae	*Egretta caerulea*

Common name	Code	Order	Family	Scientific name
Black-crowned Night-Heron	BCNH	Ciconiiformes	Ardeidae	*Nycticorax nycticorax*
Turkey Vulture	TUVU	Ciconiiformes	Cathartidae	*Cathartes aura*
Ross's Goose	ROGO	Anseriformes	Anatidae	*Chen rossii*
Emperor Goose	EMGO	Anseriformes	Anatidae	*Chen canagica*
Snow Goose	SNGO	Anseriformes	Anatidae	*Chen caerulescens*
Greater White-fronted Goose	GWFG	Anseriformes	Anatidae	*Anser albifrons*
Canada Goose	CAGO	Anseriformes	Anatidae	*Branta canadensis*
Cackling Canada Goose	CAGOM	Anseriformes	Anatidae	*Branta Canadensis minima*
Aleutian Canada Goose	CAGOL	Anseriformes	Anatidae	*Branta Canadensis leucopareia*
(Black) Brant	BRANB	Anseriformes	Anatidae	*Branta bernicula nigricans*
(American) Brant	BRANA	Anseriformes	Anatidae	*Branta bernicula horta*
Tundra Swan	TUSW	Anseriformes	Anatidae	*Cygnus columbianus*
Mallard	MALL	Anseriformes	Anatidae	*Anas platyrhynchos*
Gadwall	GADW	Anseriformes	Anatidae	*Anas strepera*
Northern Pintail	NOPI	Anseriformes	Anatidae	*Anas acuta*
Green-winged Teal	GWTE	Anseriformes	Anatidae	*Anas crecca*
Cinnamon Teal	CITE	Anseriformes	Anatidae	*Anas cyanoptera*
Blue-winged Teal	BWTE	Anseriformes	Anatidae	*Anas discors*
American Wigeon	AMWI	Anseriformes	Anatidae	*Anas americana*
Eurasian Wigeon	EUWI	Anseriformes	Anatidae	*Anas penelope*
Northern Shoveler	NOSH	Anseriformes	Anatidae	*Anas clypeata*
Redhead	REHE	Anseriformes	Anatidae	*Aythya americana*
Canvasback	CANV	Anseriformes	Anatidae	*Aythya valisineria*
Ring-necked Duck	RNDU	Anseriformes	Anatidae	*Aythya collaris*
Greater Scaup	GRSC	Anseriformes	Anatidae	*Aythya marila*
Lesser Scaup	LESC	Anseriformes	Anatidae	*Aythya affinis*

Common name	Code	Order	Family	Scientific name
Tufted Duck	TUDU	Anseriformes	Anatidae	*Aythya fuligula*
Common Goldeneye	COGO	Anseriformes	Anatidae	*Bucephala clangula*
Barrow's Goldeneye	BAGO	Anseriformes	Anatidae	*Bucephala islandica*
Bufflehead	BUFF	Anseriformes	Anatidae	*Bucephala albeola*
Harlequin Duck	HADU	Anseriformes	Anatidae	*Histrionicus histrionicus*
White-winged Scoter	WWSC	Anseriformes	Anatidae	*Melanitta fusca*
Surf Scoter	SUSC	Anseriformes	Anatidae	*Melanitta perspicillata*
Black Scoter	BLSC	Anseriformes	Anatidae	*Melanitta nigra*
Long-tailed Duck	LTDU	Anseriformes	Anatidae	*Clangula hyemalis*
Ruddy Duck	RUDU	Anseriformes	Anatidae	*Oxyura jamaicensis*
Hooded Merganser	HOME	Anseriformes	Anatidae	*Lophodytes cucullatus*
Red-breasted Merganser	RBME	Anseriformes	Anatidae	*Mergus serrator*
Common Merganser	COME	Anseriformes	Anatidae	*Mergus merganser*
King Eider	KIEI	Anseriformes	Anatidae	*Somateria spectabilis*
Osprey	OSPR	Falconiformes	Accipitridae	*Pandion haliaetus*
Bald Eagle	BAEA	Falconiformes	Accipitridae	*Halliaeetus leucocephalus*
Northern Harrier	NOHA	Falconiformes	Accipitridae	*Circus cyaneus*
Red-shouldered Hawk	RSHA	Falconiformes	Accipitridae	*Buteo lineatus*
Red-tailed Hawk	RTHA	Falconiformes	Accipitridae	*Buteo jamaicensis*
Peregrine Falcon	PRFA	Falconiformes	Falconidae	*Falco peregrinus*
Peregrine Falcon (anatum)	PRFAA	Falconiformes	Falconidae	*Falco peregrinus anatum*
Prairie Falcon	PRFA	Falconiformes	Falconidae	*Falco mexicanus*
Merlin	MERL	Falconiformes	Falconidae	*Falso columbarius*
Common Moorhen	COMO	Gruiformes	Rallidae	*Gallinula chloropus*
American Coot	AMCO	Gruiformes	Rallidae	*Fulica americana*
Virginia Rail	VIRA	Gruiformes	Rallidae	*Rallus limicola*

Common name	Code	Order	Family	Scientific name
Sora	VIRA	Gruiformes	Rallidae	*Porzana carolina*
California Clapper Rail	CLRA	Gruiformes	Rallidae	*Rallus longirostris obsoletus*
Black Rail	BLRA	Gruiformes	Rallidae	*Laterallus jamaicensis*
Yellow Rail	YERA	Gruiformes	Rallidae	*Coturnicops noveboracensis*
Black-bellied Plover	BBPL	Charadriiformes	Charadriidae	*Pluvialis squatarola*
American Golden-Plover	AMGP	Charadriiformes	Charadriidae	*Pluvialis dominica*
Pacific Golden-Plover	PAGP	Charadriiformes	Charadriidae	Pluvialis fulva
Golden-Plover species	GOPL	Charadriiformes	Charadriidae	*Pluvialis dominica* or *P. fulva*
Western Snowy Plover	SNPL	Charadriiformes	Charadriidae	*Charadrius alexandrinus nivosus*
Semipalmated Plover	SEPL	Charadriiformes	Charadriidae	*Charadrius semipalmatus*
Killdeer	KILL	Charadriiformes	Charadriidae	*Charadrius vociferus*
Black Oystercatcher	BLOY	Charadriiformes	Haematopodidae	*Haematopus bachmani*
American Avocet	AMAV	Charadriiformes	Recurvirostridae	*Recurvirostra americana*
Greater Yellowlegs	GRYE	Charadriiformes	Scolopacidae	*Tringa melanoleuca*
Solitary Sandpiper	SOSA	Charadriiformes	Scolopacidae	*Tringa solitaria*
Wandering Tattler	WATA	Charadriiformes	Scolopacidae	*Heteroscelus incanus*
Willet	WILL	Charadriiformes	Scolopacidae	*Catoptrophorus semipalmatus*
Spotted Sandpiper	SPSA	Charadriiformes	Scolopacidae	*Actitis macularia*
Whimbrel	WHIM	Charadriiformes	Scolopacidae	*Numenius phaeopus*
Long-billed Curlew	LBCU	Charadriiformes	Scolopacidae	*Numenius americanus*
Marbled Godwit	MAGO	Charadriiformes	Scolopacidae	*Limos fedoa*
Ruddy Turnstone	RUTU	Charadriiformes	Scolopacidae	*Arenaria interpres*
Black Turnstone	BLTU	Charadriiformes	Scolopacidae	*Arenaria melanocephala*
Surfbird	SURF	Charadriiformes	Scolopacidae	*Aphriza virgata*
Red Knot	REKN	Charadriiformes	Scolopacidae	*Calidris canutus*
Sanderling	SAND	Charadriiformes	Scolopacidae	*Calidris alba*

Common name	Code	Order	Family	Scientific name
Western Sandpiper	WESA	Charadriiformes	Scolopacidae	*Calidris mauri*
Semipalmated Sandpiper	SESA	Charadriiformes	Scolopacidae	*Calidris pusilla*
Stilt Sandpiper	STSA	Charadriiformes	Scolopacidae	*Calidris himantopus*
Least Sandpiper	LESA	Charadriiformes	Scolopacidae	*Calidris minutilla*
Baird's Sandpiper	BASA	Charadriiformes	Scolopacidae	*Calidris bairdii*
Pectoral Sandpiper	PESA	Charadriiformes	Scolopacidae	*Calidris melanotos*
Dunlin	DUNL	Charadriiformes	Scolopacidae	*Calidris alpina*
Ruff	RUFF	Charadriiformes	Scolopacidae	*Philomachus pugnax*
Short-billed Dowitcher	SBDO	Charadriiformes	Scolopacidae	*Limnodromus griseus*
Long-billed Dowitcher	LBDO	Charadriiformes	Scolopacidae	*Limnodromus scolopaceus*
Dowitcher species	DOWI	Charadriiformes	Scolopacidae	*Limnodromus* spp.
Wilson's Snipe	WISN	Charadriiformes	Scolopacidae	*Gallinago delicata*
Red-necked Phalarope	RNPH	Charadriiformes	Scolopacidae	*Phalaropus lobatus*
Red Phalarope	REPH	Charadriiformes	Scolopacidae	*Phalarupus fulicaria*
Parasitic Jaeger	PAJA	Charadriiformes	Laridae	*Stercorarius parasiticus*
Franklin's Gull	FRGU	Charadriiformes	Laridae	*Larus pipixcan*
Laughing Gull	LAGU	Charadriiformes	Laridae	*Larus atricilla*
Black-headed Gull	BHGU	Charadriiformes	Laridae	*Larus ridibundus*
Little Gull	LIGU	Charadriiformes	Laridae	*Larus minutus*
Bonaparte's Gull	BOGU	Charadriiformes	Laridae	*Larus philadelphia*
Heermann's Gull	HRGU	Charadriiformes	Laridae	*Larus heermanni*
Mew Gull	MEGU	Charadriiformes	Laridae	*Larus canus*
Ring-billed Gull	RBGU	Charadriiformes	Laridae	*Larus delawarensis*
California Gull	CAGU	Charadriiformes	Laridae	*Larus californicus*
Herring Gull	HEGU	Charadriiformes	Laridae	*Larus argentatus*
Thayer's Gull	THGU	Charadriiformes	Laridae	*Larus thayeri*

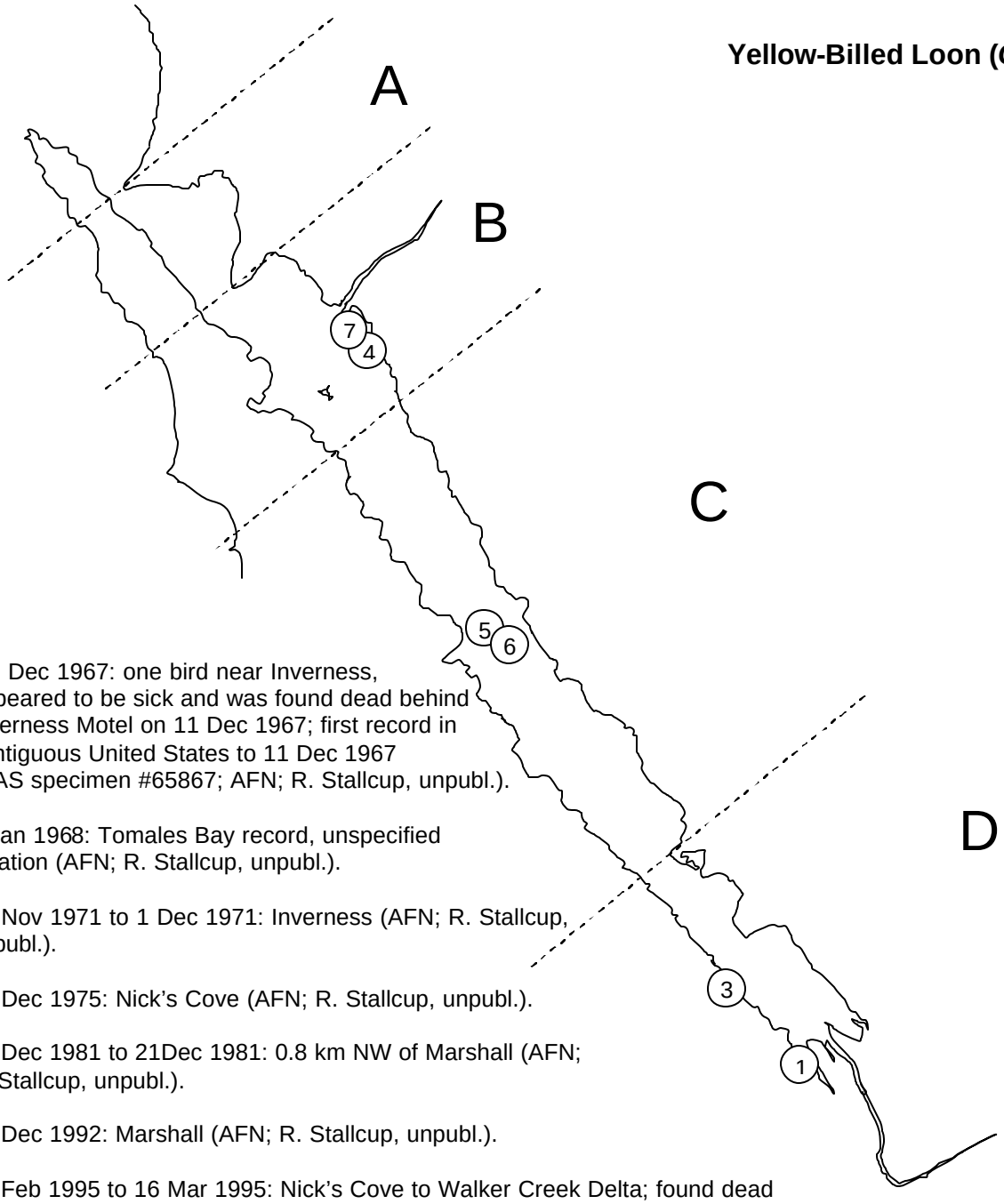
Common name	Code	Order	Family	Scientific name
Western Gull	WEGU	Charadriiformes	Laridae	*Larus occidentalis*
Glaucous-winged Gull	GWGU	Charadriiformes	Laridae	*Larus glaucescens*
Glaucous Gull	GLGU	Charadriiformes	Laridae	*Larus hyperboreus*
Black-legged Kittiwake	BLKI	Charadriiformes	Laridae	*Rissa tridactyla*
Caspian Tern	CATE	Charadriiformes	Laridae	*Sterna caspia*
Royal Tern	ROTE	Charadriiformes	Laridae	*Sterna maxima*
Elegant Tern	ELTE	Charadriiformes	Laridae	*Sterna elegans*
Common Tern	COTE	Charadriiformes	Laridae	*Sterna hirundo*
Arctic Tern	ARTE	Charadriiformes	Laridae	*Sterna paradisaea*
Forster's Tern	FOTE	Charadriiformes	Laridae	*Sterna forsteri*
California Least Tern	LETE	Charadriiformes	Laridae	*Sterna antillarumbrowni*
Black Tern	BLTE	Charadriiformes	Laridae	*Chlidonias niger*
Black Skimmer	BLSK	Charadriiformes	Laridae	*Rynchops niger*
Common Murre	COMU	Charadriiformes	Alcidae	*Uria aalge*
Pigeon guillemot	PIGU	Charadriiformes	Alcidae	*Cepphus columba*
Marbled Murrelet	MAMU	Charadriiformes	Alcidae	*Brachyramphus marmoratus*
Rhinoceros Auklet	RHAU	Charadriiformes	Alcidae	*Cerorhinca monocerata*
Cassin's Auklet	CAAU	Charadriiformes	Alcidae	*Ptychoramphus aleuticus*
Barn Owl	BAOW	Strigiformes	Tytonidae	*Tyto alba*
Great-horned Owl	GHOW	Strigiformes	Strigidae	*Bubo virginianus*
Short-eared Owl	SEOW	Strigiformes	Strigidae	*Asio flammeus*
Belted Kingfisher	BEKI	Coraciiformes	Alcedinidae	*Ceryle alcyon*
Black Phoebe	BLPH	Passeriformes	Tyrannidae	*Sayornis nigricans*
American Crow	AMCR	Passeriformes	Corvidae	*Corvus brachyrhynchos*
Common Raven	CORA	Passeriformes	Corvidae	*Corvus corax*
Horned Lark	HOLA	Passeriformes	Alaudidae	*Eremophila alpestris*

Common name	Code	Order	Family	Scientific name
Marsh Wren	MAWR	Passeriformes	Troglodytidae	*Cistothorus palustris*
American Pipit	AMPI	Passeriformes	Motacillidae	*Anthus rubescens*
Loggerhead Shrike	LOSH	Passeriformes	Laniidae	*Lanius ludovicianus*
Northern Shrike	NOSH	Passeriformes	Laniidae	*Lanius excubitor*
Common Yellowthroat	COYE	Passeriformes	Parulidae	*Geothlypis trichas*
Savannah Sparrow	SASP	Passeriformes	Emberizidae	*Passerculus sandwichensis*
Nelson's Sharp-tailed Sparrow	NSTS	Passeriformes	Emberizidae	*Ammodramus nelsoni*
Song Sparrow	SOSP	Passeriformes	Emberizidae	*Melospiza melodia*
Swamp Sparrow	SWSP	Passeriformes	Emberizidae	*Melospiza georgiana*
Lincoln's Sparrow	LISP	Passeriformes	Emberizidae	*Melospiza LINCOLNII*
Golden-crowned Sparrow	GCSP	Passeriformes	Emberizidae	*Zonotrichia atricapilla*
White-crowned Sparrow	WCSP	Passeriformes	Emberizidae	*Zonotrichia albicollis*
Western Meadowlark	WEME	Passeriformes	Emberizidae	*Sturnella neglecta*

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Yellow-Billed Loon (*Gavia adamsii*)

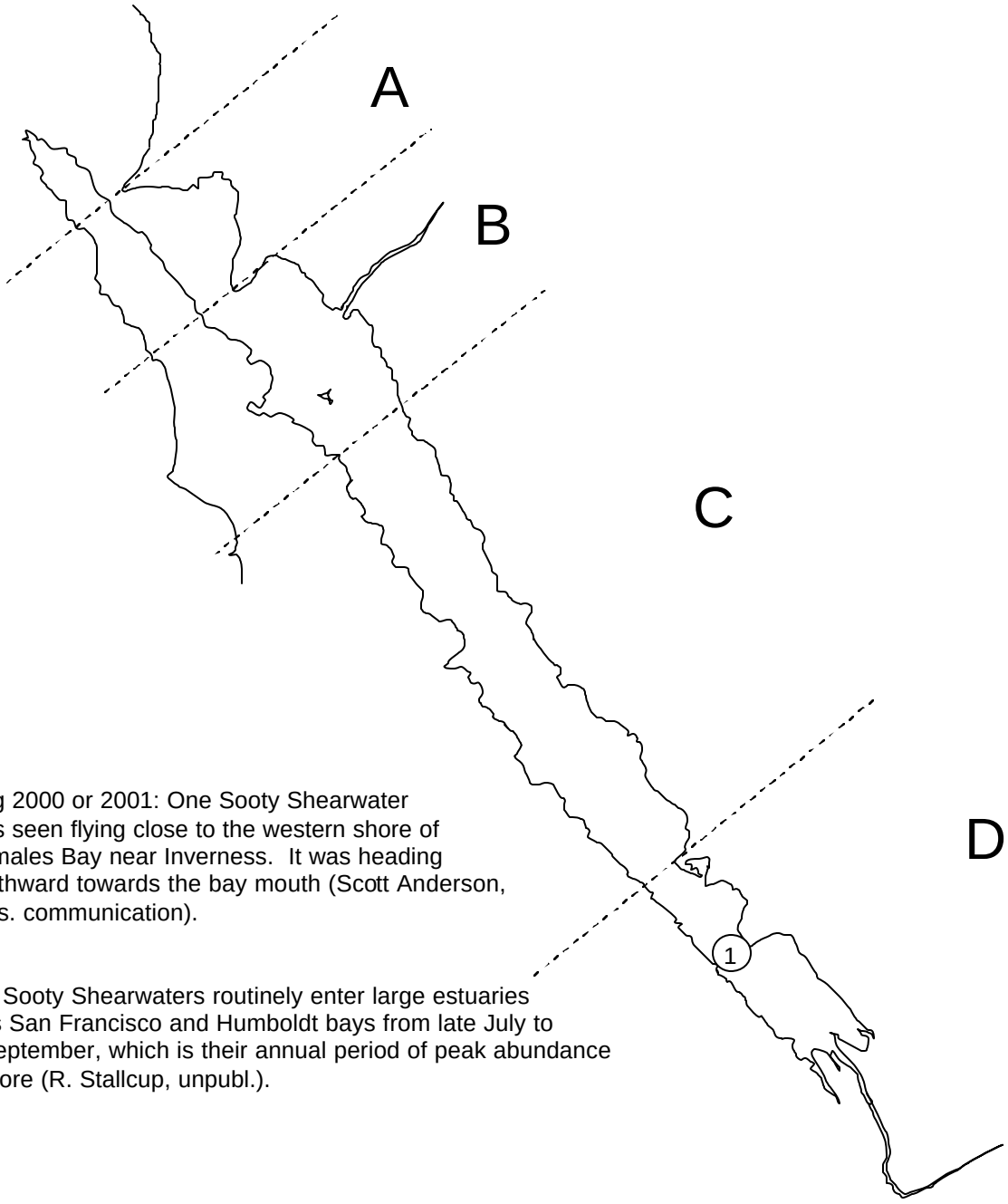


1. 1-8 Dec 1967: one bird near Inverness, appeared to be sick and was found dead behind Inverness Motel on 11 Dec 1967; first record in contiguous United States to 11 Dec 1967 (CAS specimen #65867; AFN; R. Stallcup, unpubl.).
2. 1 Jan 1968: Tomales Bay record, unspecified location (AFN; R. Stallcup, unpubl.).
3. 11 Nov 1971 to 1 Dec 1971: Inverness (AFN; R. Stallcup, unpubl.).
4. 20 Dec 1975: Nick's Cove (AFN; R. Stallcup, unpubl.).
5. 18 Dec 1981 to 21Dec 1981: 0.8 km NW of Marshall (AFN; R. Stallcup, unpubl.).
6. 18 Dec 1992: Marshall (AFN; R. Stallcup, unpubl.).
7. 19 Feb 1995 to 16 Mar 1995: Nick's Cove to Walker Creek Delta; found dead 19 Mar 1995 on Sand Point (Lawson's Landing) by Leslie Grella and subsequently taken to CAS; seventh specimen collected in California (CAS; AFN; R. Stallcup, unpubl.)

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Sooty Shearwater (*Puffinus griseus*)



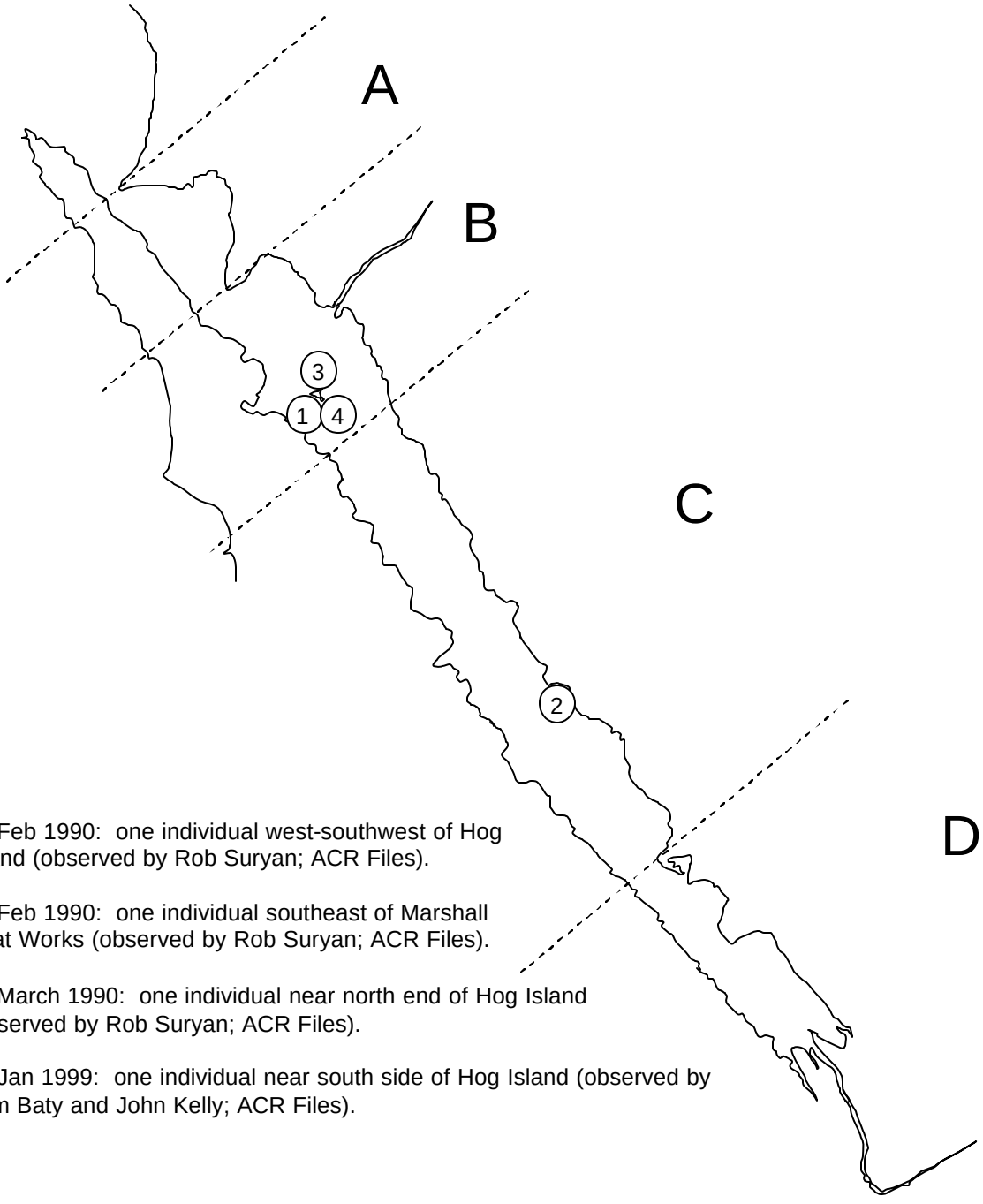
1. Aug 2000 or 2001: One Sooty Shearwater was seen flying close to the western shore of Tomales Bay near Inverness. It was heading northward towards the bay mouth (Scott Anderson, pers. communication).

Notes: Sooty Shearwaters routinely enter large estuaries such as San Francisco and Humboldt bays from late July to early September, which is their annual period of peak abundance near shore (R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Fork-tailed Storm-Petrel (*Oceanodroma furcata*)

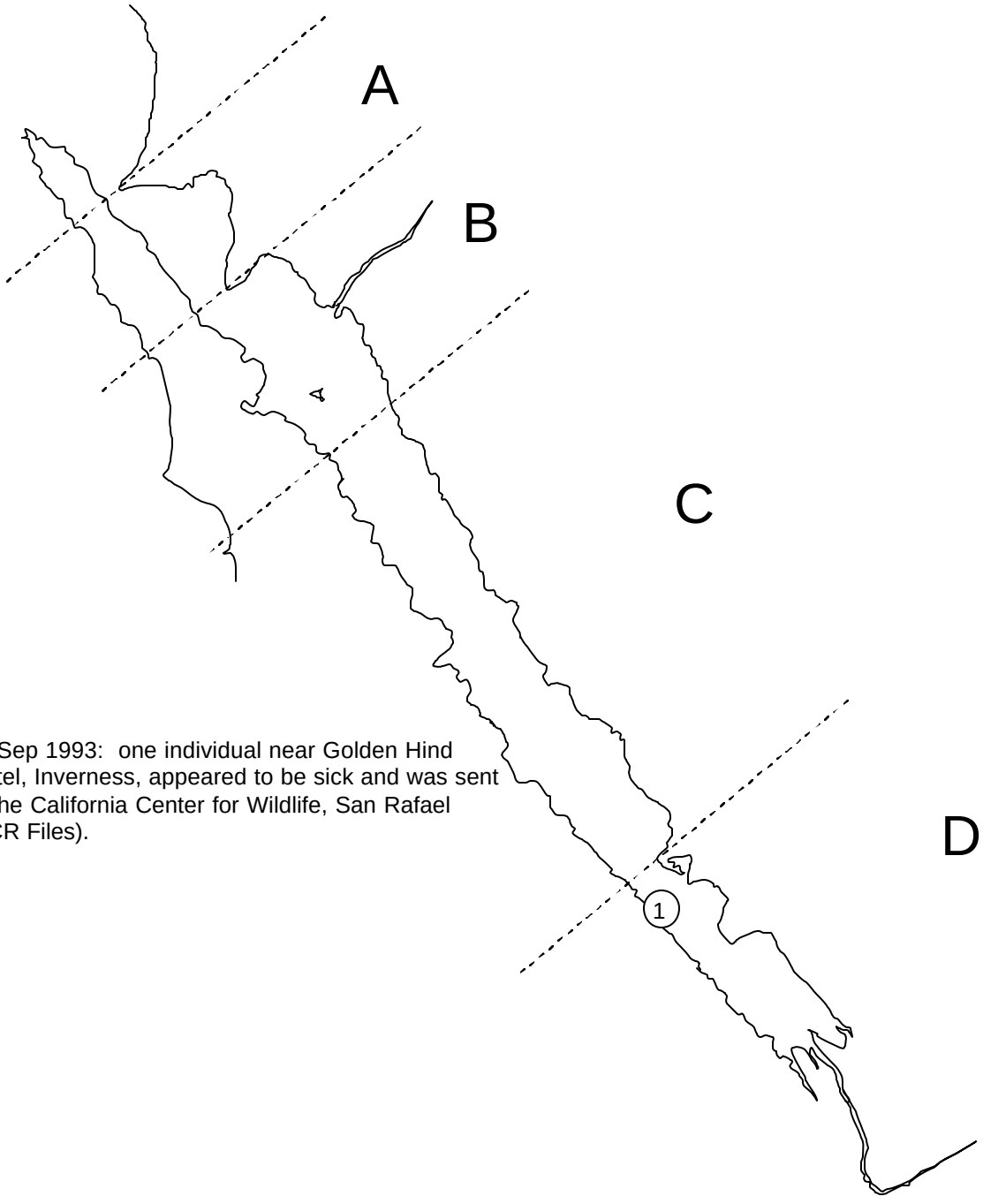


1. 14 Feb 1990: one individual west-southwest of Hog Island (observed by Rob Suryan; ACR Files).
2. 16 Feb 1990: one individual southeast of Marshall Boat Works (observed by Rob Suryan; ACR Files).
3. 13 March 1990: one individual near north end of Hog Island (observed by Rob Suryan; ACR Files).
4. 30 Jan 1999: one individual near south side of Hog Island (observed by Tom Baty and John Kelly; ACR Files).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Ashy Storm-Petrel (*Oceanodroma homochroa*)

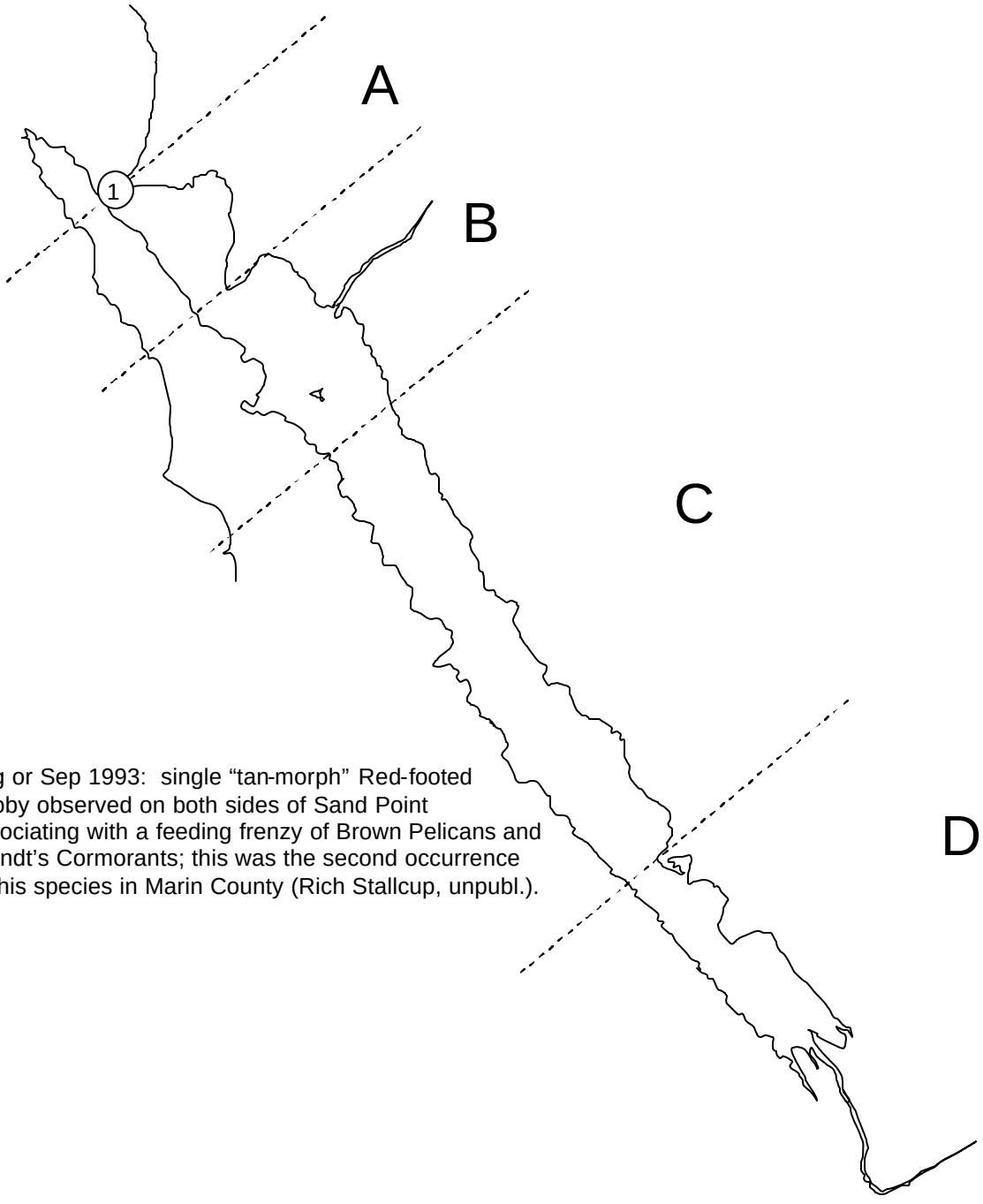


1. 19 Sep 1993: one individual near Golden Hind Motel, Inverness, appeared to be sick and was sent to the California Center for Wildlife, San Rafael (ACR Files).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

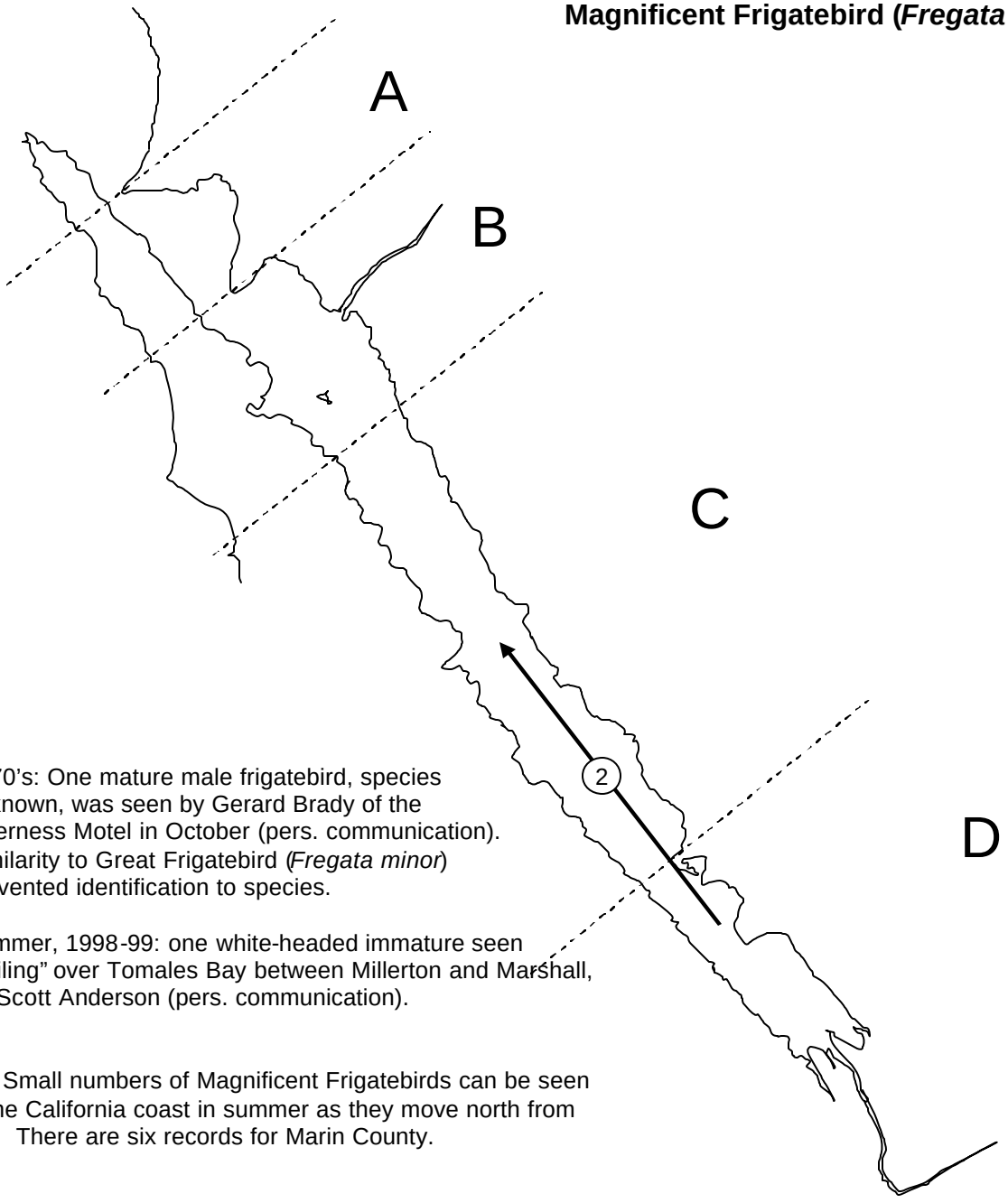
Red-Footed Booby *(*Sula sula*)*



1. Aug or Sep 1993: single “tan-morph” Red-footed Booby observed on both sides of Sand Point associating with a feeding frenzy of Brown Pelicans and Brandt’s Cormorants; this was the second occurrence of this species in Marin County (Rich Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY
(See Table 6 for sub-area occurrences of other bird species.)

Magnificent Frigatebird (*Fregata magnificens*)



1. 1970's: One mature male frigatebird, species unknown, was seen by Gerard Brady of the Inverness Motel in October (pers. communication). Similarity to Great Frigatebird (*Fregata minor*) prevented identification to species.

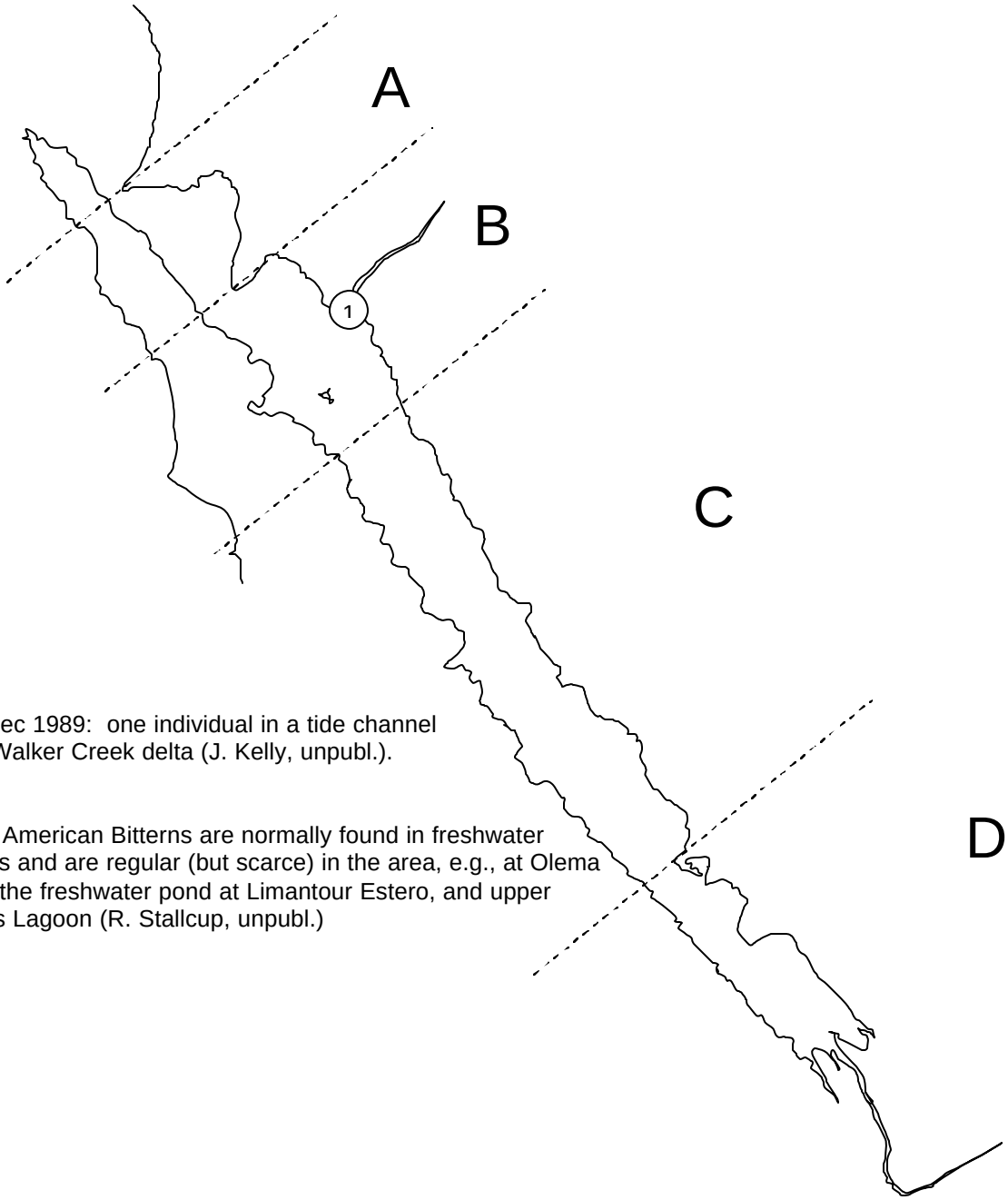
2. Summer, 1998-99: one white-headed immature seen "sailing" over Tomales Bay between Millerton and Marshall, by Scott Anderson (pers. communication).

Notes: Small numbers of Magnificent Frigatebirds can be seen along the California coast in summer as they move north from Mexico. There are six records for Marin County.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

American Bittern (*Botaurus lentiginosus*)



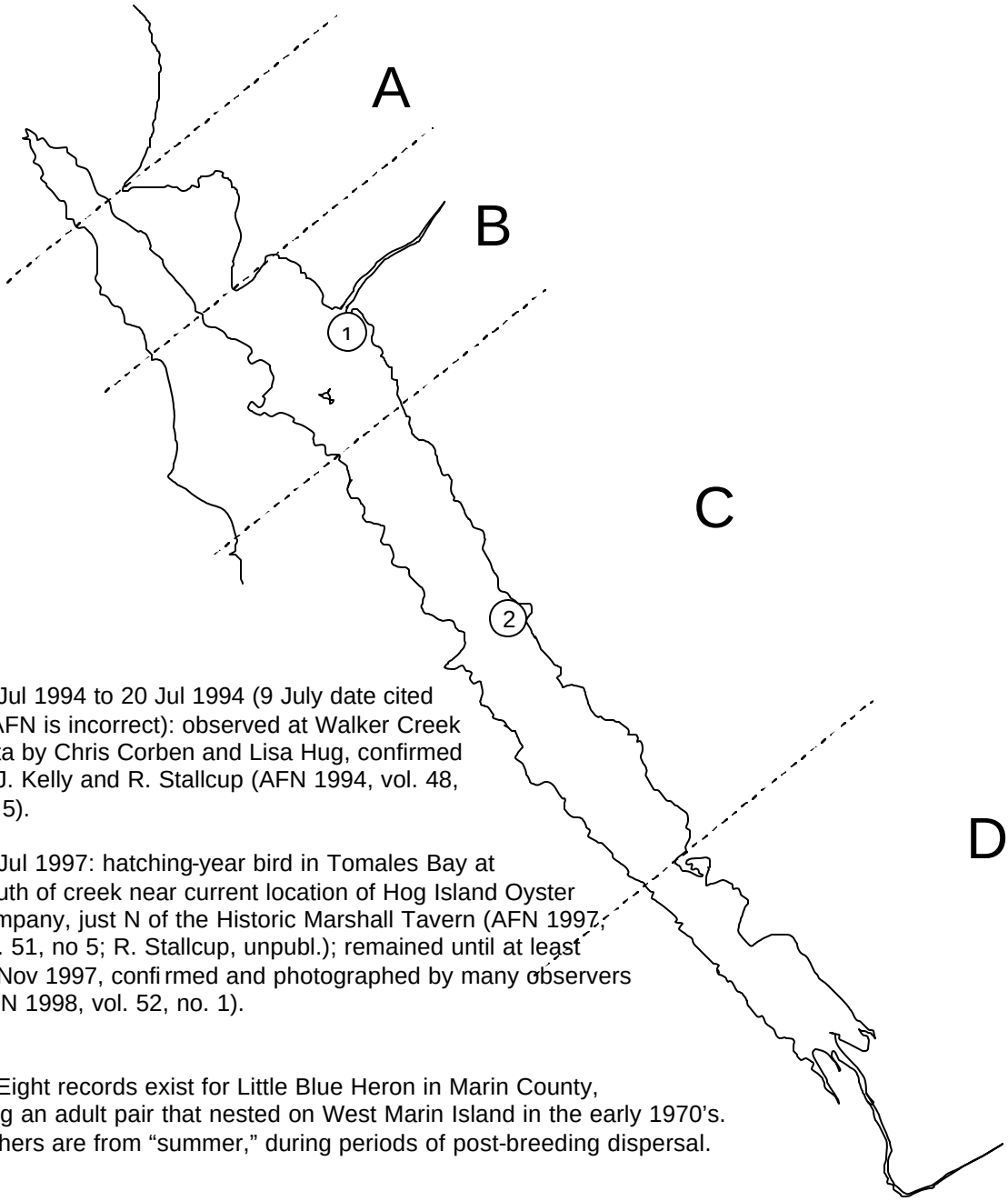
1. 7 Dec 1989: one individual in a tide channel at Walker Creek delta (J. Kelly, unpubl.).

Notes: American Bitterns are normally found in freshwater Marshes and are regular (but scarce) in the area, e.g., at Olema Marsh, the freshwater pond at Limantour Estero, and upper Abbott's Lagoon (R. Stallcup, unpubl.)

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Little Blue Heron (*Egretta caerulea*)



1. 18 Jul 1994 to 20 Jul 1994 (9 July date cited in AFN is incorrect): observed at Walker Creek delta by Chris Corben and Lisa Hug, confirmed by J. Kelly and R. Stallcup (AFN 1994, vol. 48, no. 5).

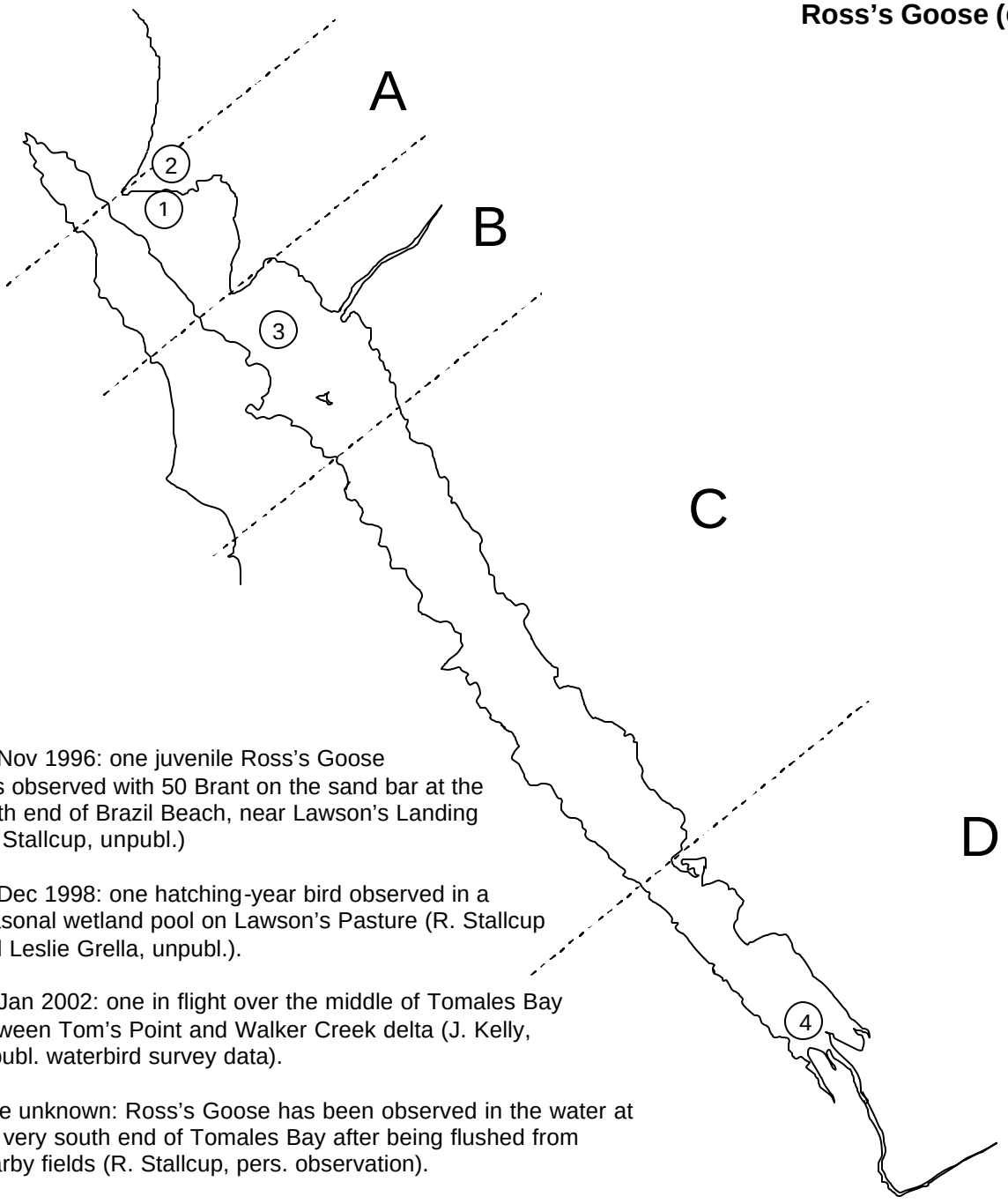
2. 18 Jul 1997: hatching-year bird in Tomales Bay at mouth of creek near current location of Hog Island Oyster Company, just N of the Historic Marshall Tavern (AFN 1997, Vol. 51, no 5; R. Stallcup, unpubl.); remained until at least 15 Nov 1997, confirmed and photographed by many observers (AFN 1998, vol. 52, no. 1).

Notes: Eight records exist for Little Blue Heron in Marin County, including an adult pair that nested on West Marin Island in the early 1970's. Most others are from "summer," during periods of post-breeding dispersal.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Ross's Goose (*Chen rossi)*



1. 19 Nov 1996: one juvenile Ross's Goose was observed with 50 Brant on the sand bar at the north end of Brazil Beach, near Lawson's Landing (R. Stallcup, unpubl.)

2. 11 Dec 1998: one hatching-year bird observed in a seasonal wetland pool on Lawson's Pasture (R. Stallcup and Leslie Grella, unpubl.).

3. 13 Jan 2002: one in flight over the middle of Tomales Bay between Tom's Point and Walker Creek delta (J. Kelly, unpubl. waterbird survey data).

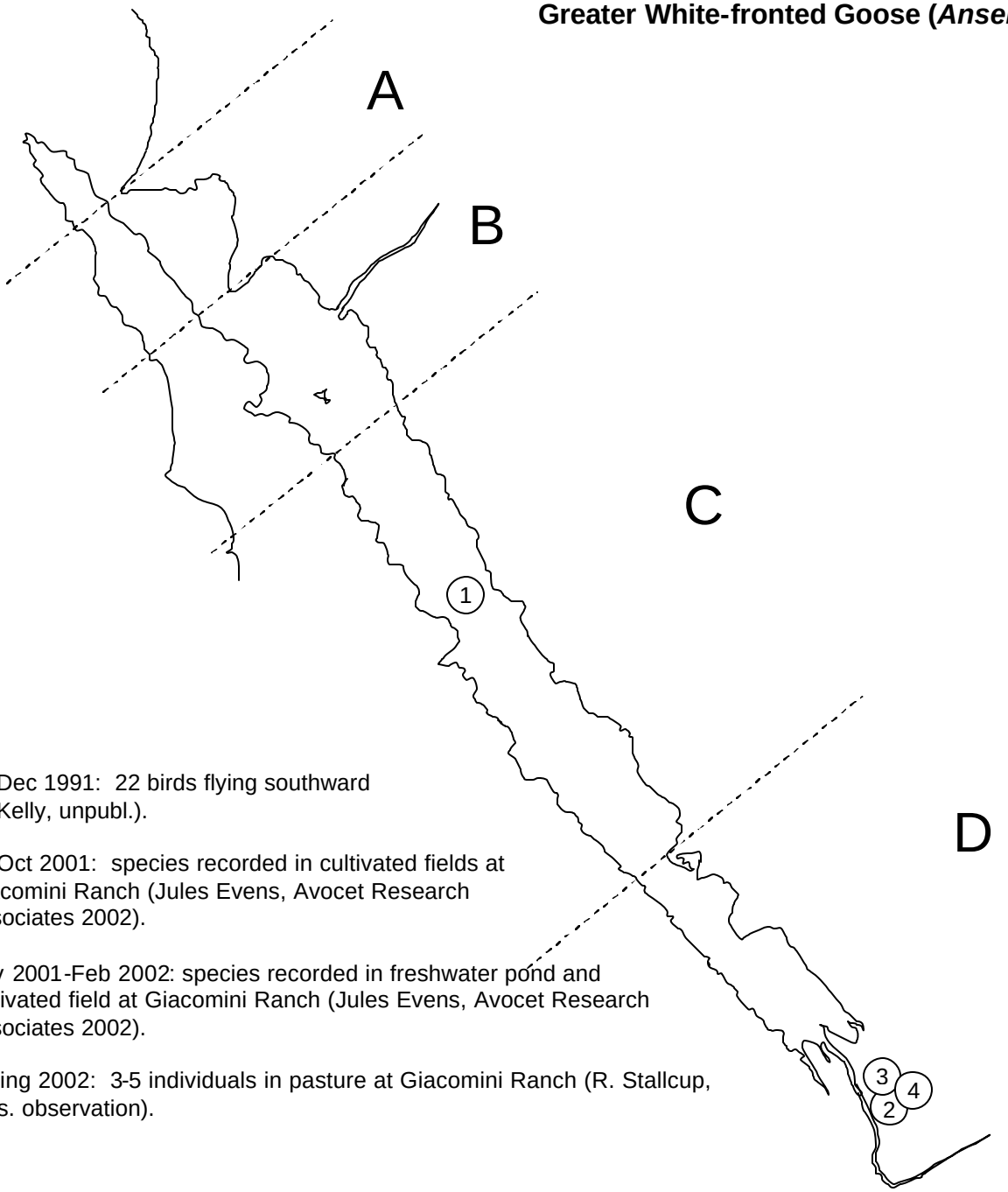
4. Date unknown: Ross's Goose has been observed in the water at the very south end of Tomales Bay after being flushed from nearby fields (R. Stallcup, pers. observation).

Notes: Ross's Goose is an uncommon visitor to western Marin County, usually observed within flocks of Snow Geese.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Greater White-fronted Goose (*Anser albifrons)*



1. 14 Dec 1991: 22 birds flying southward (J. Kelly, unpubl.).

2. 19 Oct 2001: species recorded in cultivated fields at Giacomini Ranch (Jules Evens, Avocet Research Associates 2002).

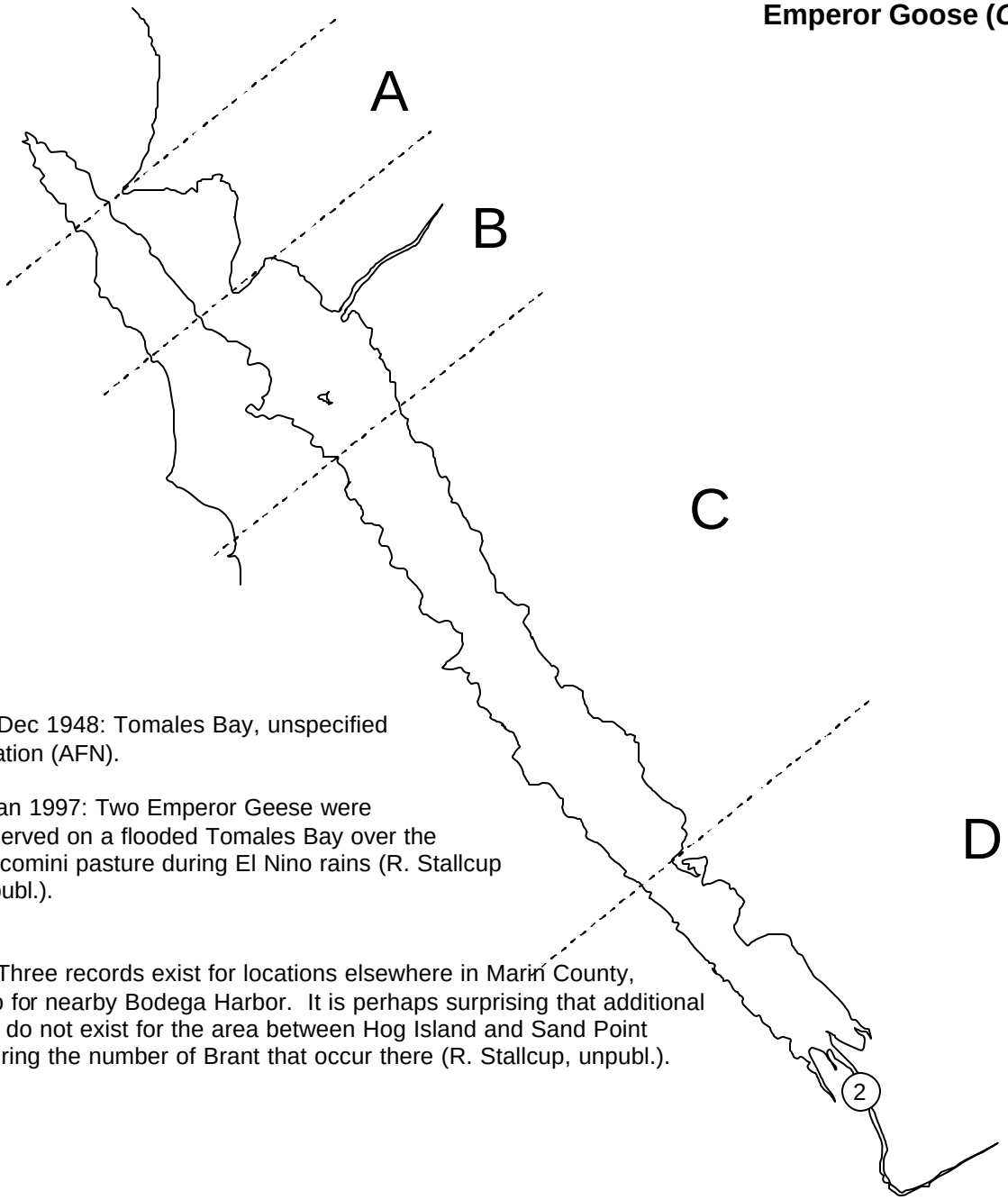
3. Nov 2001-Feb 2002: species recorded in freshwater pond and cultivated field at Giacomini Ranch (Jules Evens, Avocet Research Associates 2002).

4. Spring 2002: 3-5 individuals in pasture at Giacomini Ranch (R. Stallcup, pers. observation).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Emperor Goose (*Chen canagica*)



1. 18 Dec 1948: Tomales Bay, unspecified location (AFN).

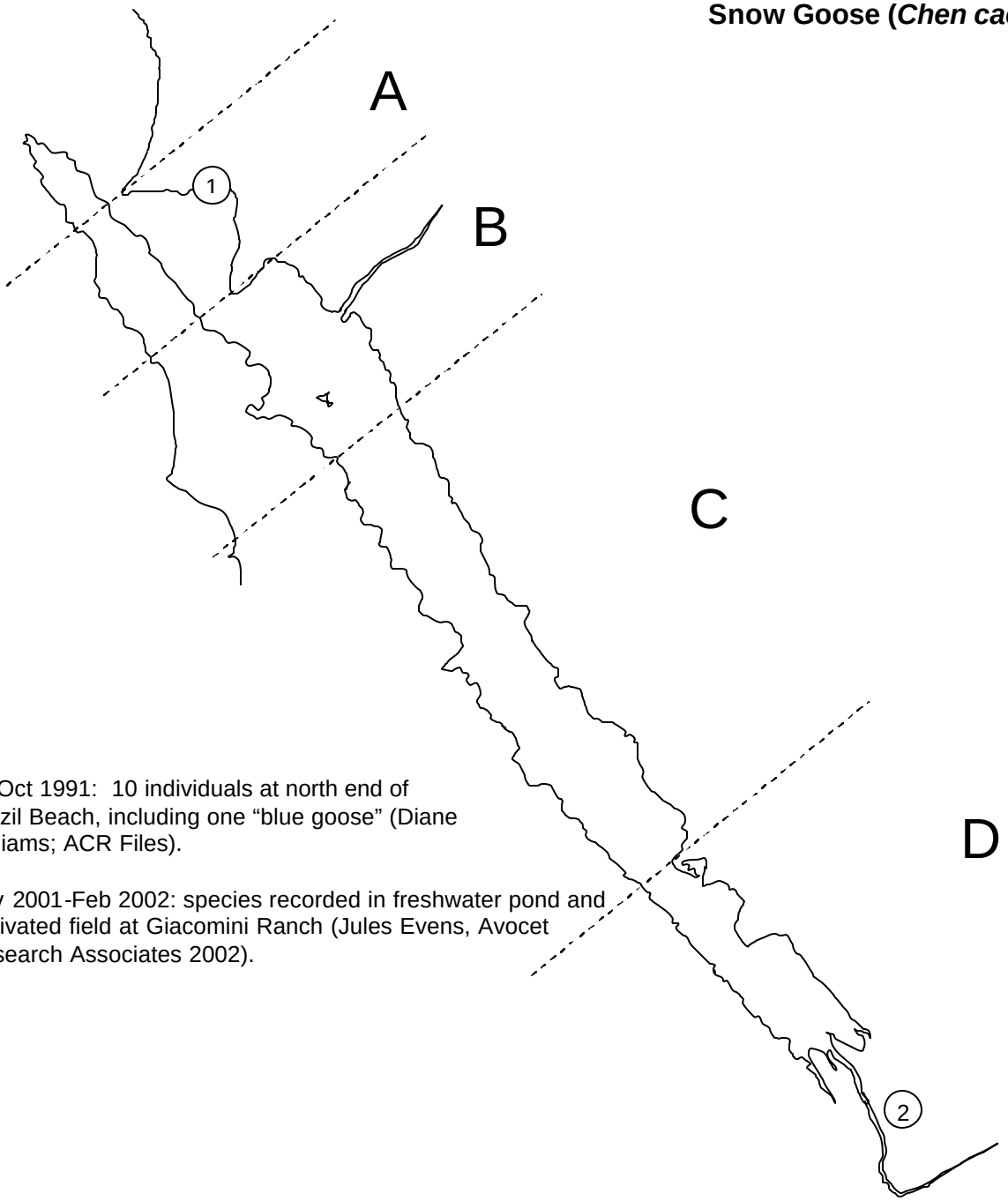
2. 4 Jan 1997: Two Emperor Geese were observed on a flooded Tomales Bay over the Giacomini pasture during El Nino rains (R. Stallcup unpubl.).

Notes: Three records exist for locations elsewhere in Marin County, and two for nearby Bodega Harbor. It is perhaps surprising that additional records do not exist for the area between Hog Island and Sand Point considering the number of Brant that occur there (R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Snow Goose (*Chen caerulescens)*



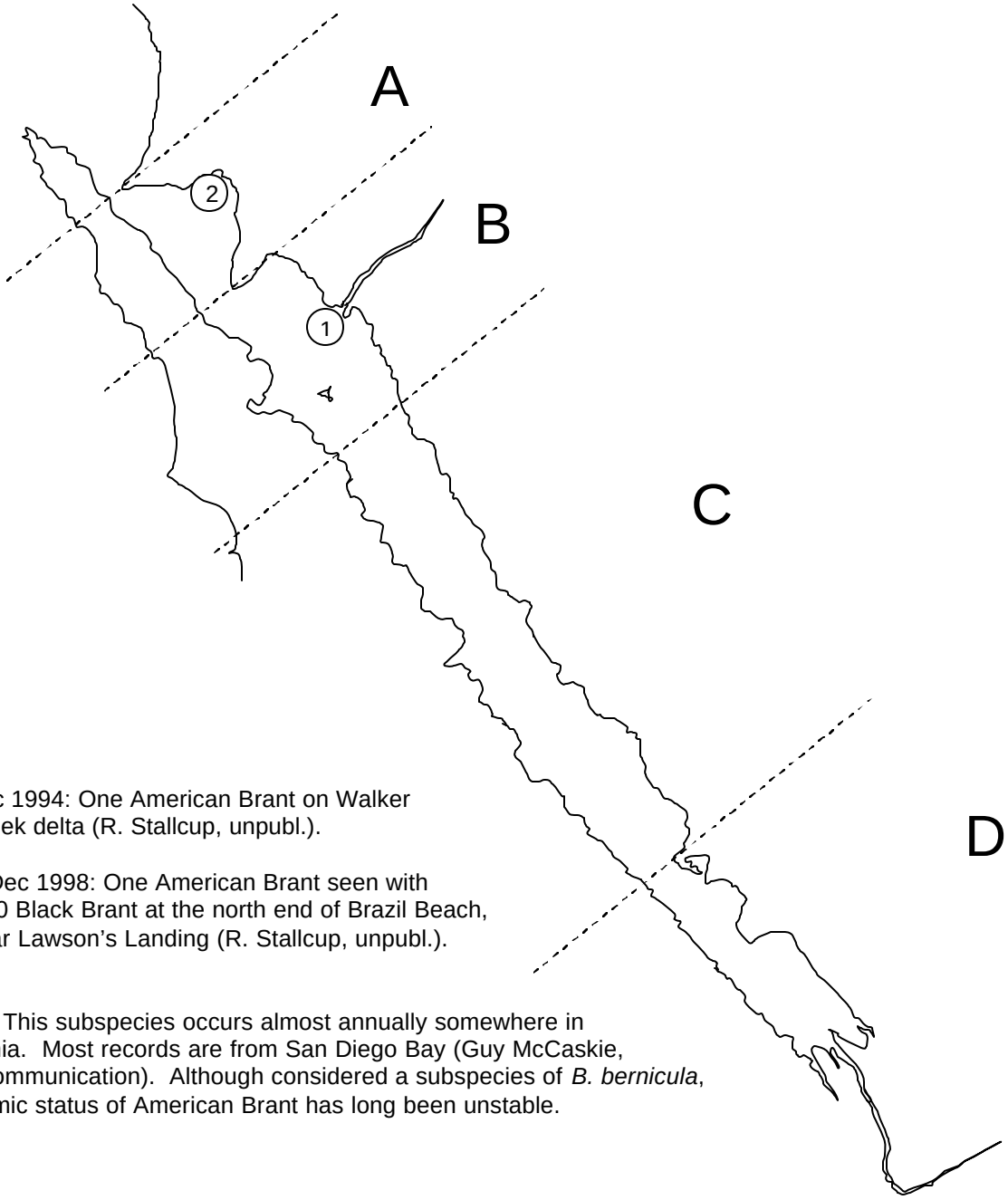
1. 31 Oct 1991: 10 individuals at north end of Brazil Beach, including one “blue goose” (Diane Williams; ACR Files).

2. Nov 2001-Feb 2002: species recorded in freshwater pond and cultivated field at Giacomini Ranch (Jules Evens, Avocet Research Associates 2002).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

(American) Brant (*Branta bernicula horta*)



1. Dec 1994: One American Brant on Walker Creek delta (R. Stallcup, unpubl.).

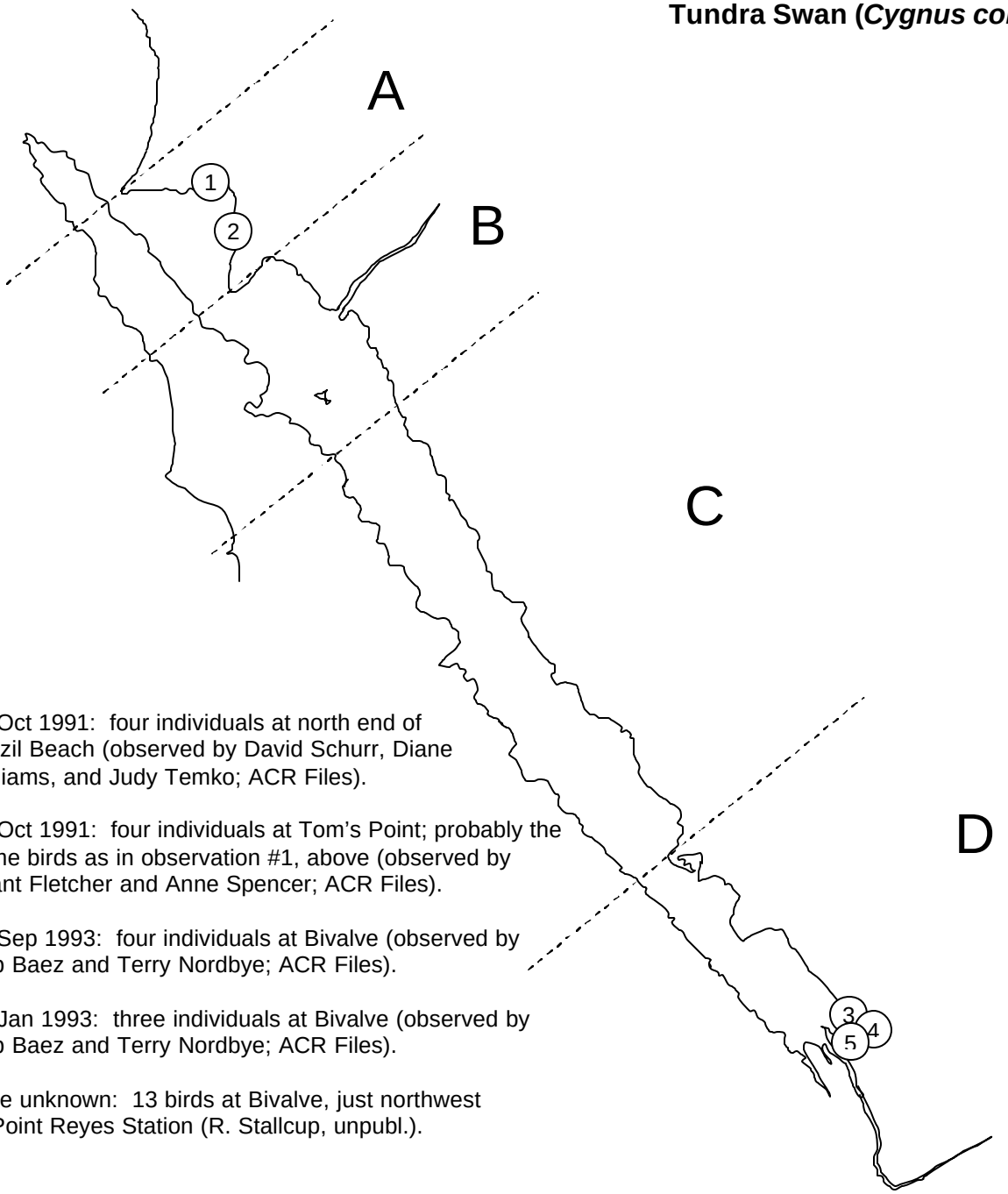
2. 11 Dec 1998: One American Brant seen with 1200 Black Brant at the north end of Brazil Beach, near Lawson's Landing (R. Stallcup, unpubl.).

Notes: This subspecies occurs almost annually somewhere in California. Most records are from San Diego Bay (Guy McCaskie, pers. communication). Although considered a subspecies of *B. bernicula*, taxonomic status of American Brant has long been unstable.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Tundra Swan (*Cygnus columbianus)*



1. 31 Oct 1991: four individuals at north end of Brazil Beach (observed by David Schurr, Diane Williams, and Judy Temko; ACR Files).

2. 31 Oct 1991: four individuals at Tom's Point; probably the same birds as in observation #1, above (observed by Grant Fletcher and Anne Spencer; ACR Files).

3. 15 Sep 1993: four individuals at Bivalve (observed by Bob Baez and Terry Nordbye; ACR Files).

4. 26 Jan 1993: three individuals at Bivalve (observed by Bob Baez and Terry Nordbye; ACR Files).

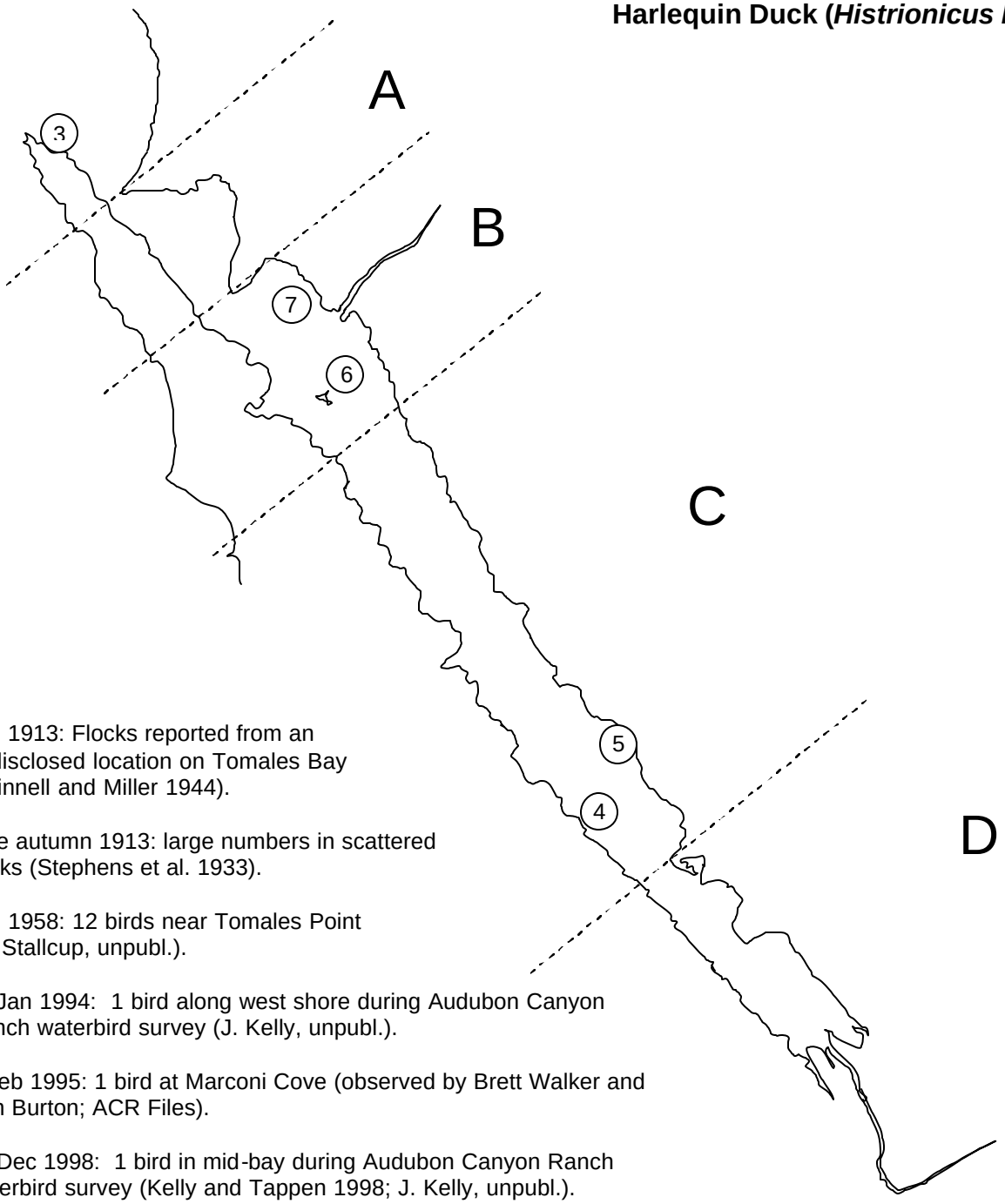
5. Date unknown: 13 birds at Bivalve, just northwest of Point Reyes Station (R. Stallcup, unpubl.).

Notes: Tundra Swans are observed in the Tomales Bay area most winters, usually in pasture habitats. Occasionally these birds fly out of fields, especially when disturbed by hunters, and land briefly on Tomales Bay. The number of individuals in the area is normally less than 20, which is much fewer than in flocks of over three hundred birds reported annually in the Garcia River "Bottoms" of Mendocino County.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Harlequin Duck (*Histrionicus histrionicus*)

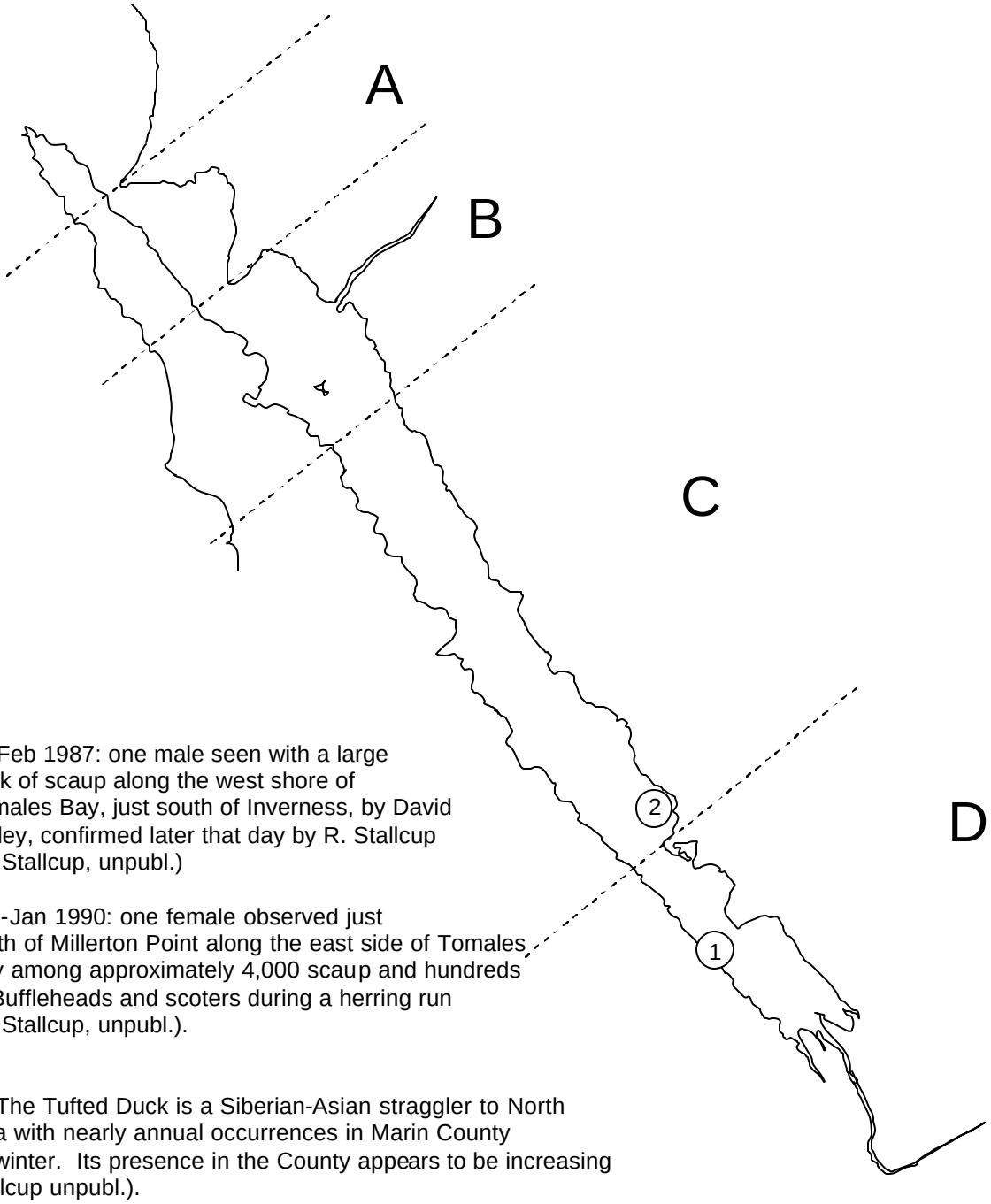


1. Jun 1913: Flocks reported from an undisclosed location on Tomales Bay (Grinnell and Miller 1944).
2. Late autumn 1913: large numbers in scattered flocks (Stephens et al. 1933).
3. Jan 1958: 12 birds near Tomales Point (R. Stallcup, unpubl.).
4. 29 Jan 1994: 1 bird along west shore during Audubon Canyon Ranch waterbird survey (J. Kelly, unpubl.).
5. 6 Feb 1995: 1 bird at Marconi Cove (observed by Brett Walker and Ken Burton; ACR Files).
6. 19 Dec 1998: 1 bird in mid-bay during Audubon Canyon Ranch waterbird survey (Kelly and Tappen 1998; J. Kelly, unpubl.).
7. 27 Jan 2001: 3 birds along east shore during Audubon Canyon Ranch waterbird survey (J. Kelly, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Tufted Duck (*Aythya fuligula*)



1. 15 Feb 1987: one male seen with a large flock of scaup along the west shore of Tomales Bay, just south of Inverness, by David Sibley, confirmed later that day by R. Stallcup (R. Stallcup, unpubl.)

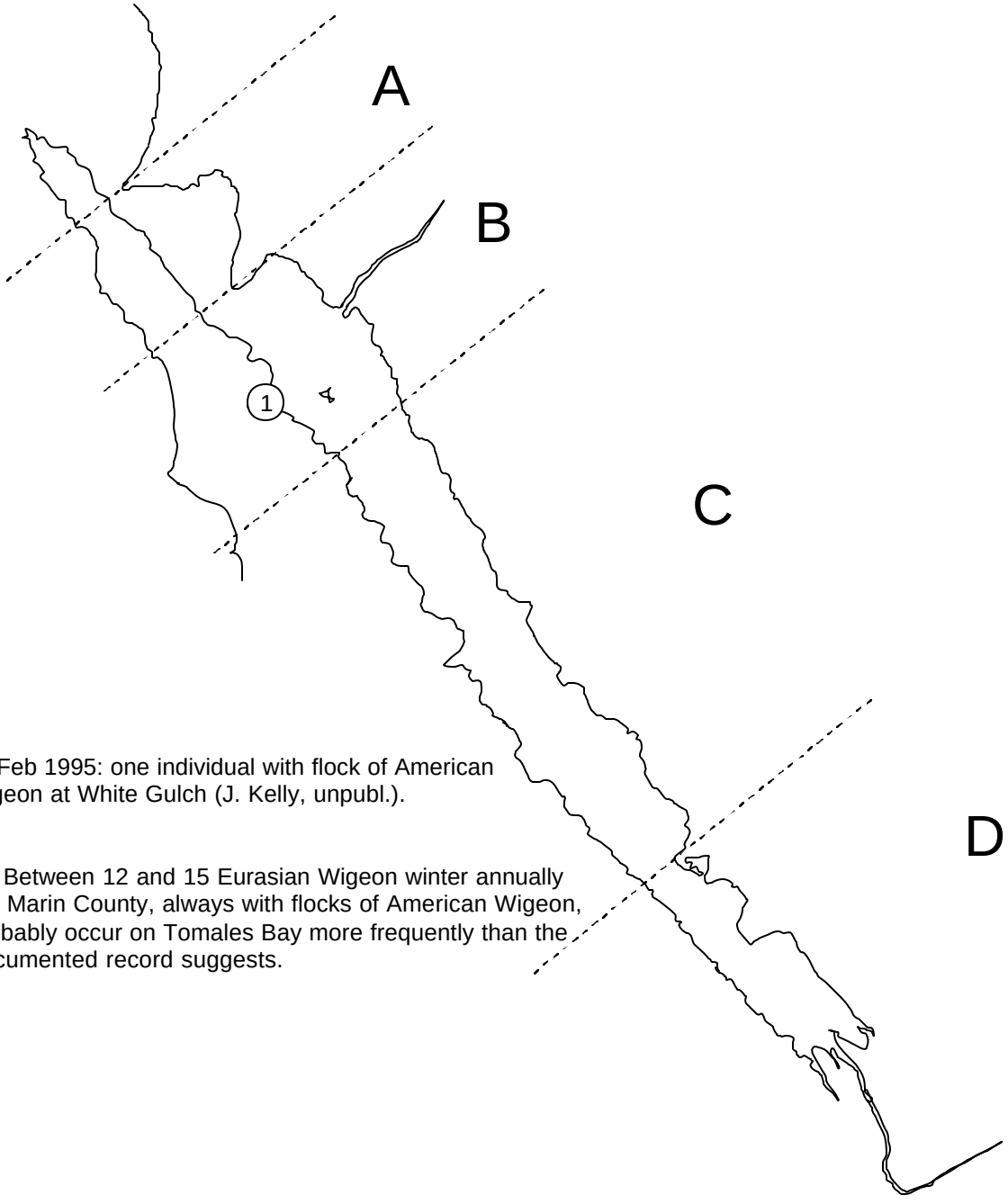
2. Mid-Jan 1990: one female observed just north of Millerton Point along the east side of Tomales Bay among approximately 4,000 scaup and hundreds of Buffleheads and scoters during a herring run (R. Stallcup, unpubl.).

Notes: The Tufted Duck is a Siberian-Asian straggler to North America with nearly annual occurrences in Marin County during winter. Its presence in the County appears to be increasing (R. Stallcup unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Eurasian Wigeon (*Anas penelope*)



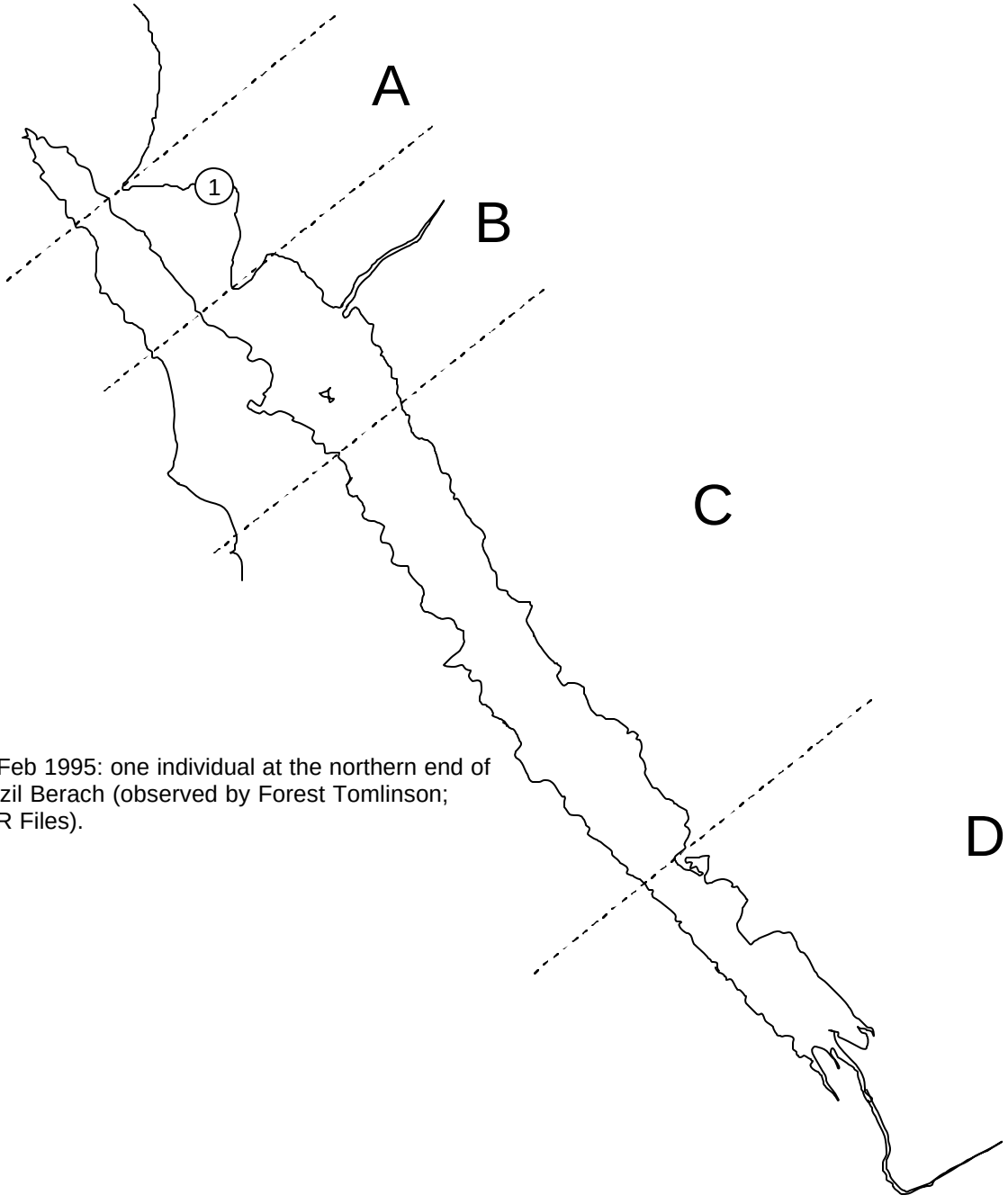
1. 17 Feb 1995: one individual with flock of American Wigeon at White Gulch (J. Kelly, unpubl.).

Notes: Between 12 and 15 Eurasian Wigeon winter annually in West Marin County, always with flocks of American Wigeon, and probably occur on Tomales Bay more frequently than the one documented record suggests.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Blue-winged Teal (*Anas discors*)

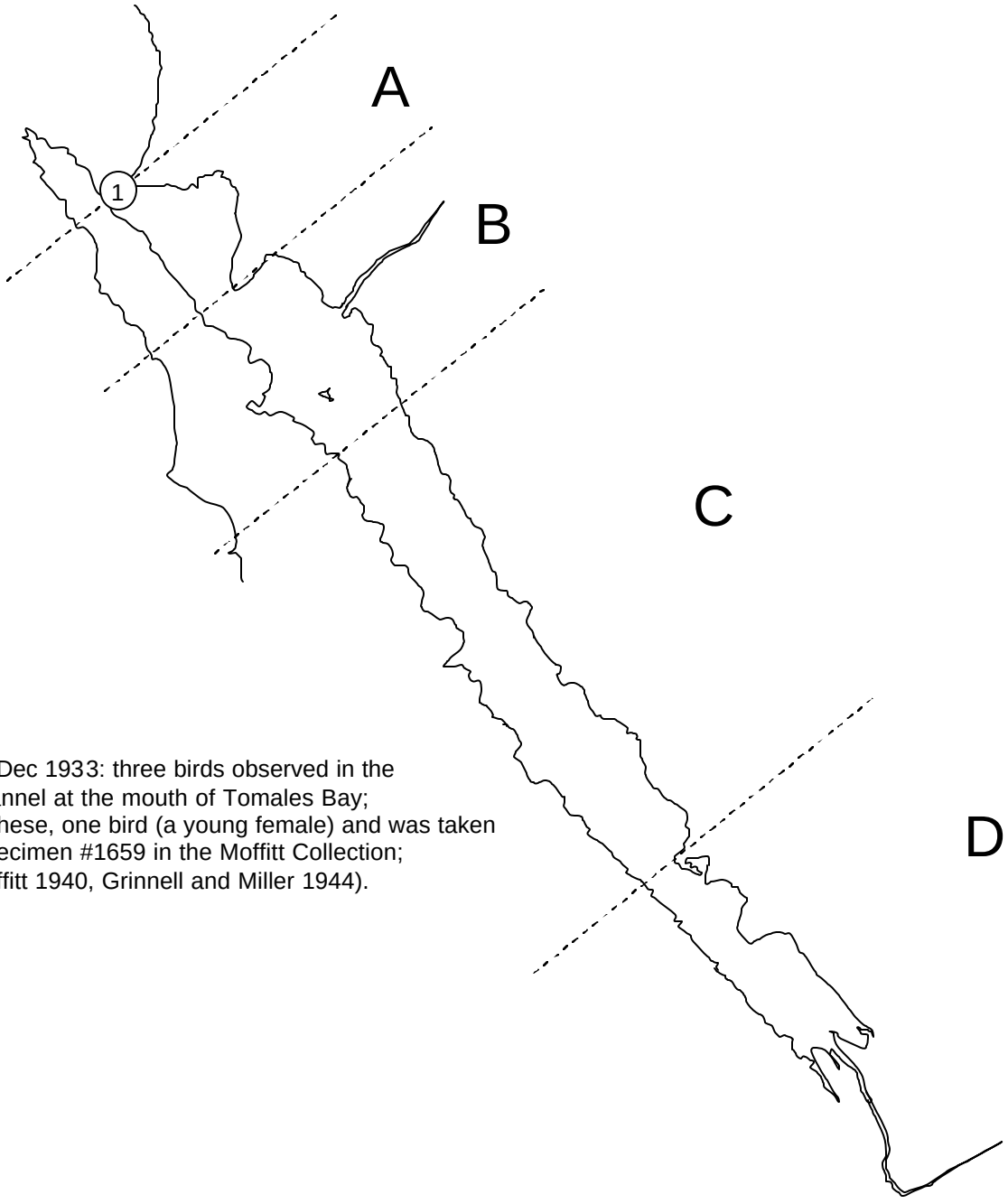


1. 17 Feb 1995: one individual at the northern end of Brazil Berach (observed by Forest Tomlinson; ACR Files).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

King Eider (*Somateria spectabilis*)

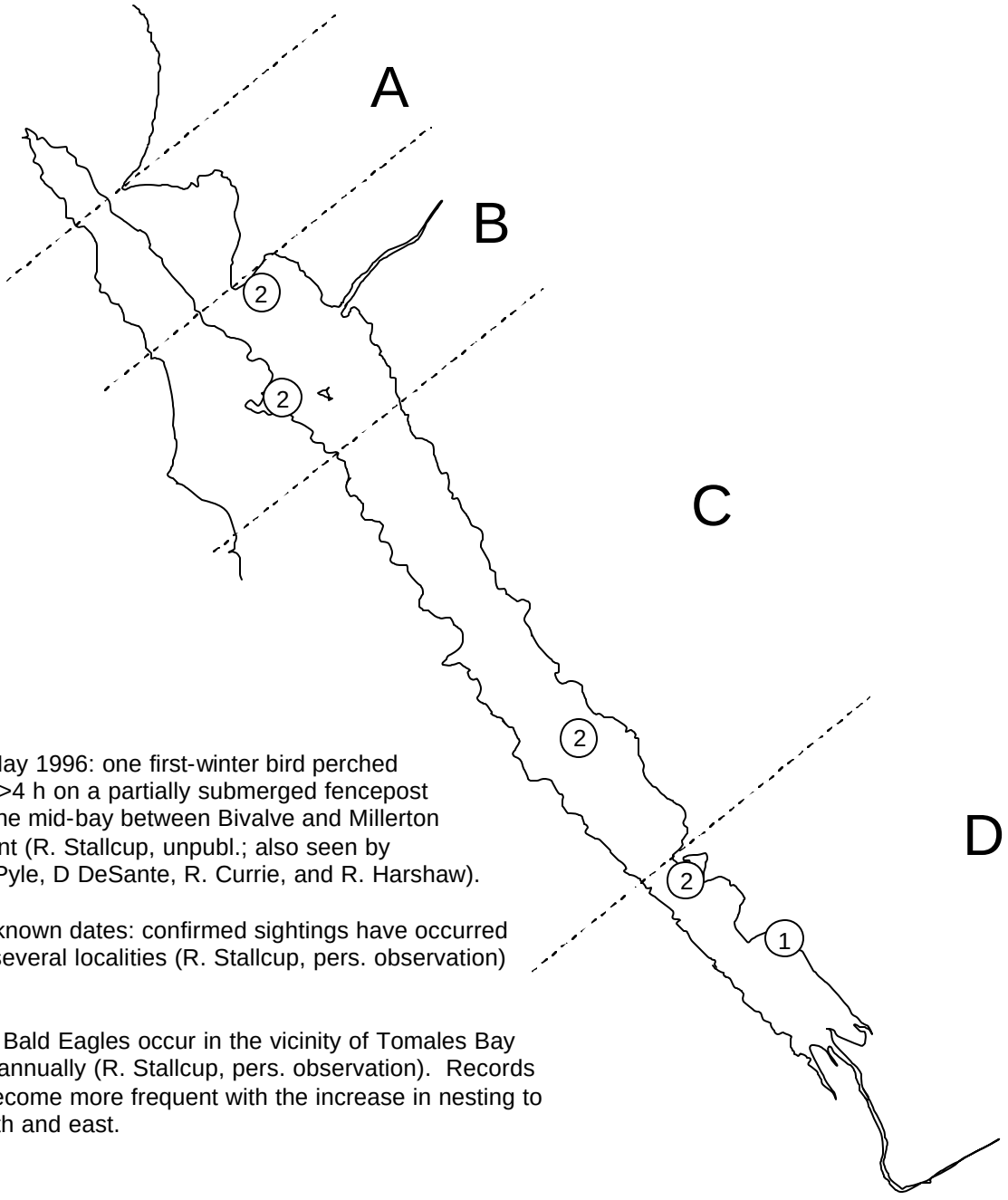


1. 16 Dec 1933: three birds observed in the channel at the mouth of Tomales Bay; of these, one bird (a young female) and was taken (specimen #1659 in the Moffitt Collection; Moffitt 1940, Grinnell and Miller 1944).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Bald Eagle (*Haliaeetus leucocephalus*)



1. 1 May 1996: one first-winter bird perched for >4 h on a partially submerged fencepost in the mid-bay between Bivalve and Millerton Point (R. Stallcup, unpubl.; also seen by P. Pyle, D DeSante, R. Currie, and R. Harshaw).

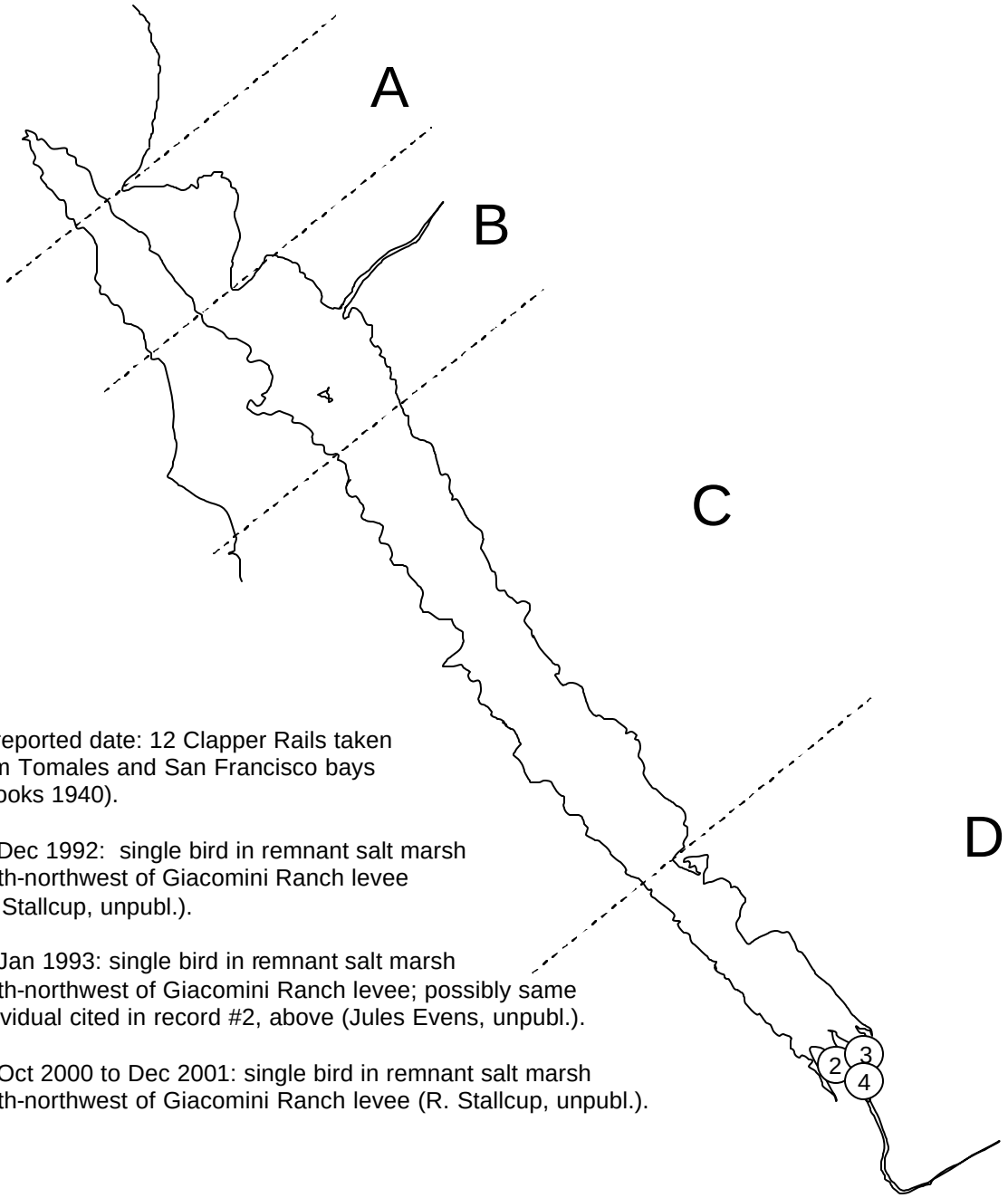
2. Unknown dates: confirmed sightings have occurred at several localities (R. Stallcup, pers. observation)

Notes: Bald Eagles occur in the vicinity of Tomales Bay almost annually (R. Stallcup, pers. observation). Records have become more frequent with the increase in nesting to the north and east.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Clapper Rail (*Rallus longirostris*)



1. Unreported date: 12 Clapper Rails taken from Tomales and San Francisco bays (Brooks 1940).

2. 12 Dec 1992: single bird in remnant salt marsh north-northwest of Giacomini Ranch levee (R. Stallcup, unpubl.).

3. 14 Jan 1993: single bird in remnant salt marsh north-northwest of Giacomini Ranch levee; possibly same individual cited in record #2, above (Jules Evens, unpubl.).

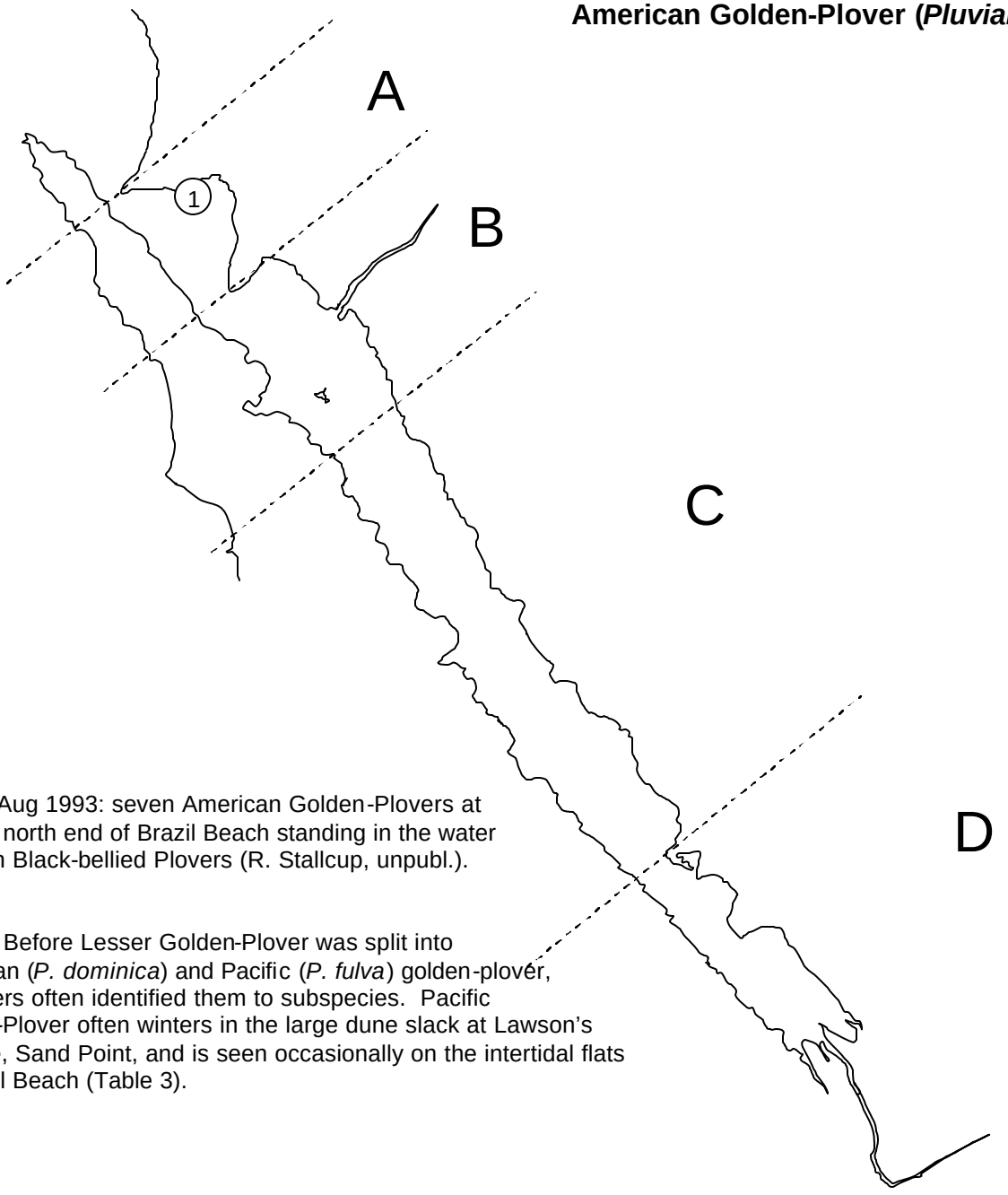
4. 20 Oct 2000 to Dec 2001: single bird in remnant salt marsh north-northwest of Giacomini Ranch levee (R. Stallcup, unpubl.).

Notes: Before levees were constructed on the Giacomini Ranch, Lagunitas Creek delta may have contained tidal sloughs of a sufficient size and age to support a breeding population of Clapper Rails.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

American Golden-Plover (*Pluvialis dominica*)



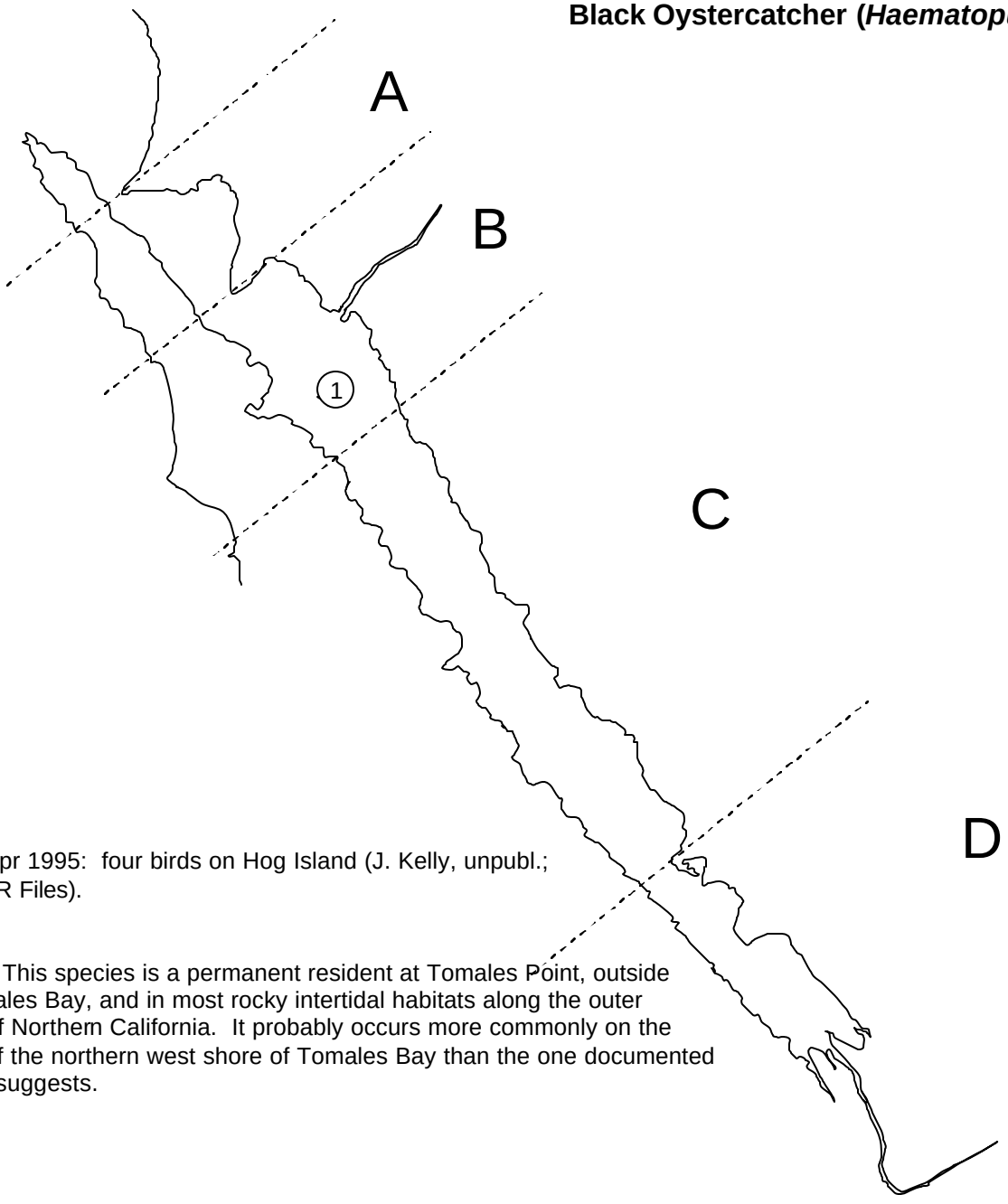
1. 25 Aug 1993: seven American Golden-Plovers at the north end of Brazil Beach standing in the water with Black-bellied Plovers (R. Stallcup, unpubl.).

Notes: Before Lesser Golden-Plover was split into American (*P. dominica*) and Pacific (*P. fulva*) golden-plover, observers often identified them to subspecies. Pacific Golden-Plover often winters in the large dune slack at Lawson's Pasture, Sand Point, and is seen occasionally on the intertidal flats of Brazil Beach (Table 3).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Black Oystercatcher (*Haematopus bachmani*)



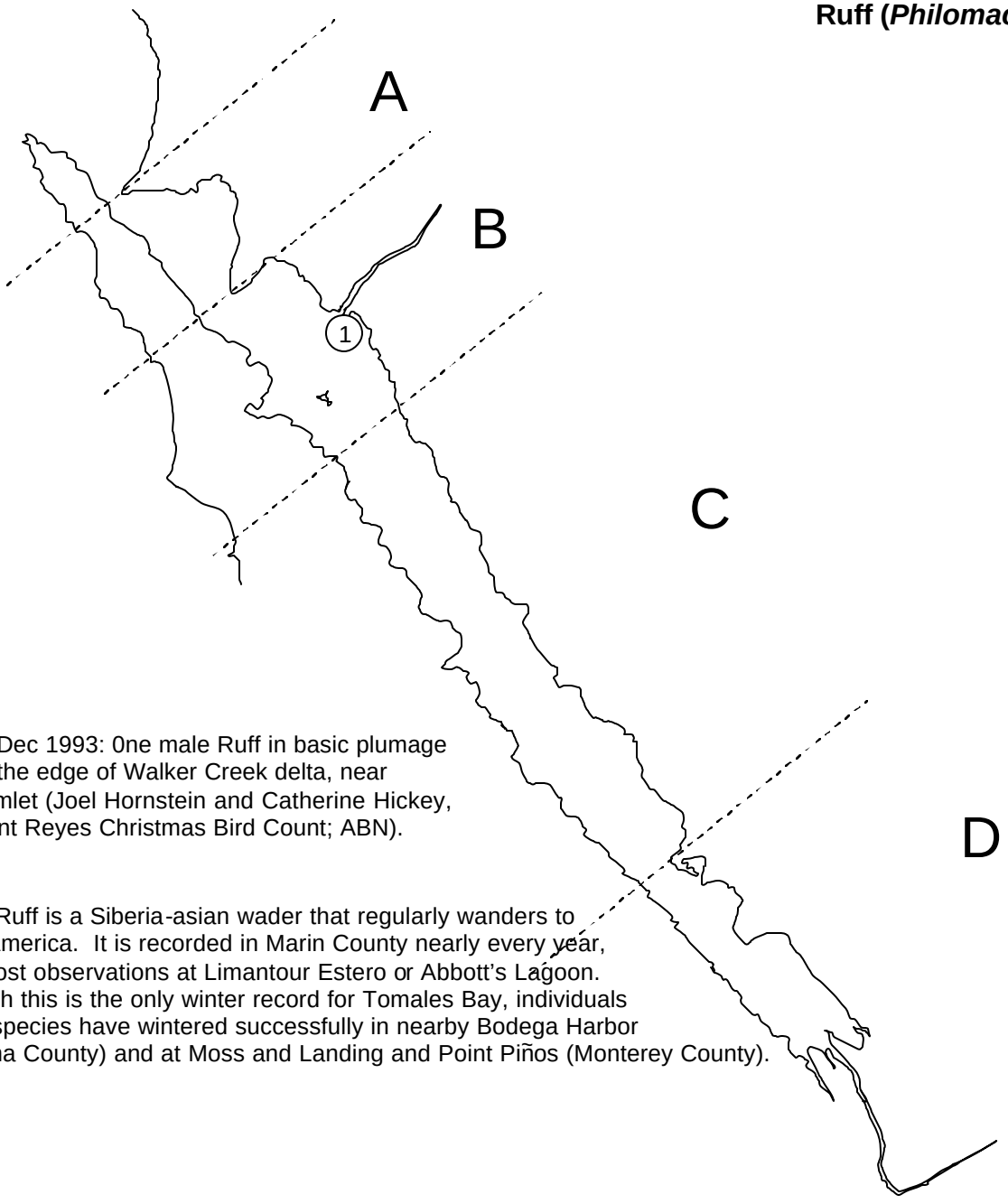
1. 3 Apr 1995: four birds on Hog Island (J. Kelly, unpubl.; ACR Files).

Notes: This species is a permanent resident at Tomales Point, outside of Tomales Bay, and in most rocky intertidal habitats along the outer coast of Northern California. It probably occurs more commonly on the rocks of the northern west shore of Tomales Bay than the one documented record suggests.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Ruff (*Philomachus pugnax*)



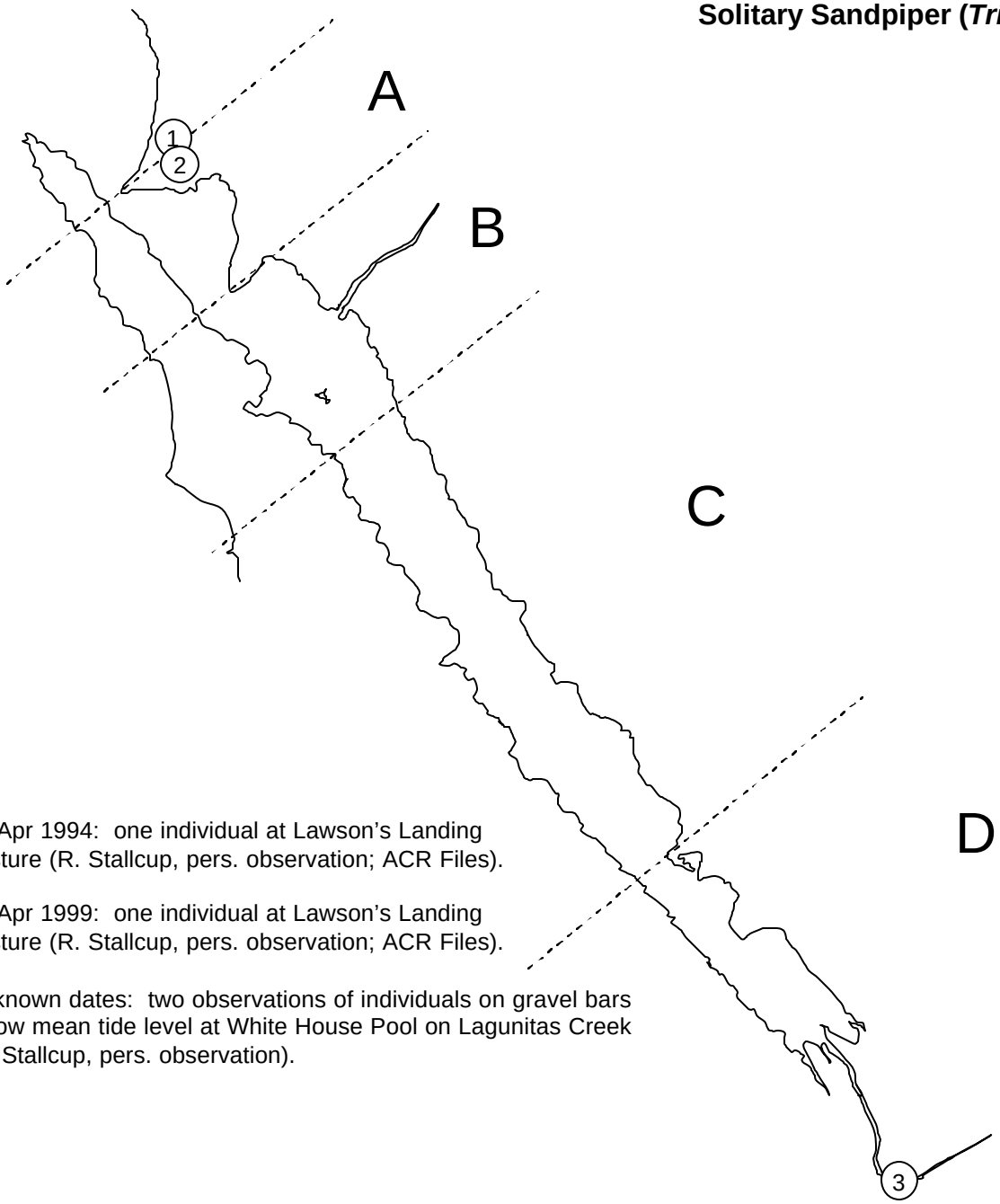
1. 18 Dec 1993: 0ne male Ruff in basic plumage on the edge of Walker Creek delta, near Hamlet (Joel Hornstein and Catherine Hickey, Point Reyes Christmas Bird Count; ABN).

Notes: Ruff is a Siberia-asian wader that regularly wanders to North America. It is recorded in Marin County nearly every year, With most observations at Limantour Estero or Abbott's Lagoon. Although this is the only winter record for Tomales Bay, individuals of this species have wintered successfully in nearby Bodega Harbor (Sonoma County) and at Moss and Landing and Point Piños (Monterey County).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Solitary Sandpiper (*Tringa solitaria*)

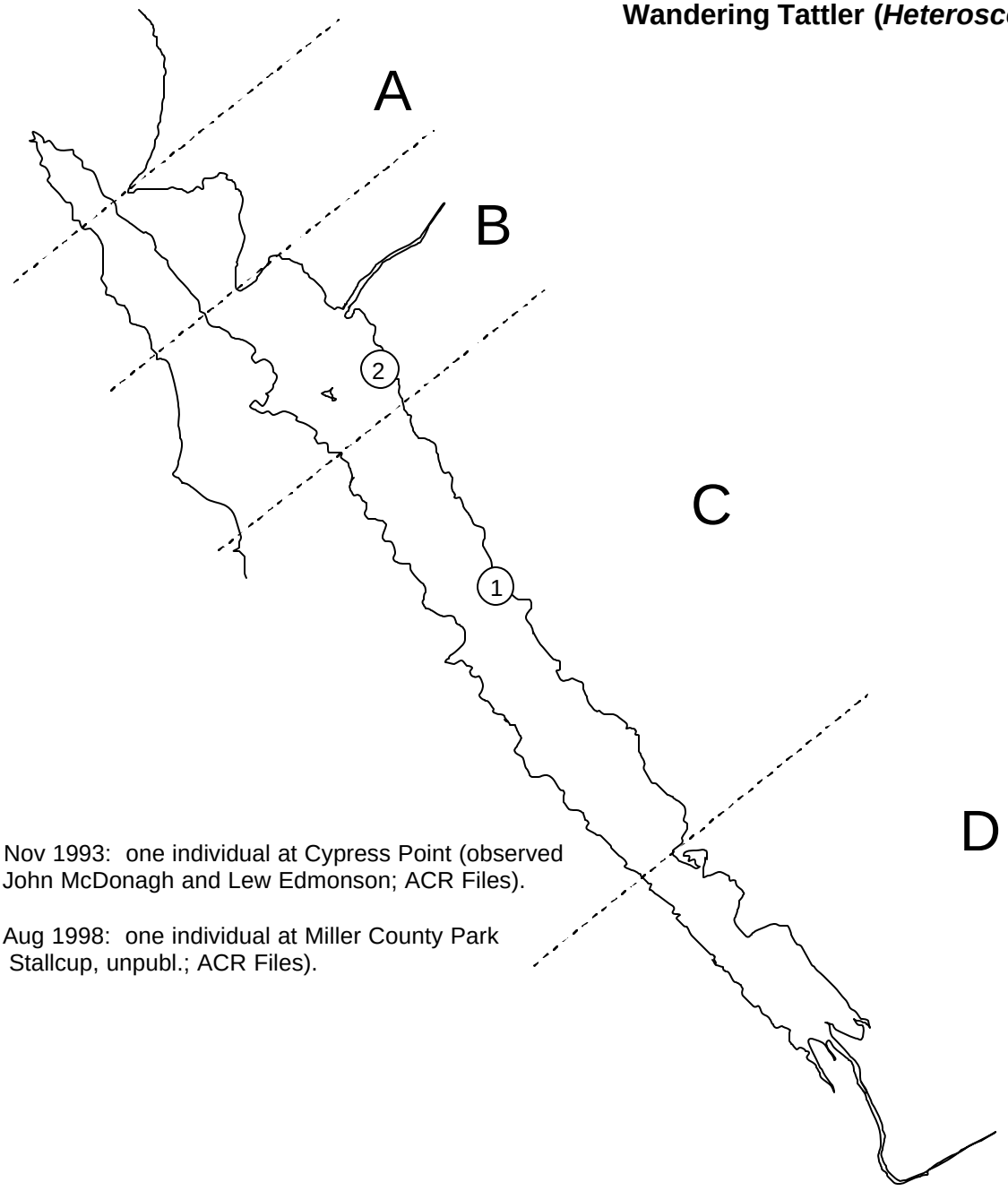


1. 25 Apr 1994: one individual at Lawson's Landing pasture (R. Stallcup, pers. observation; ACR Files).
2. 28 Apr 1999: one individual at Lawson's Landing pasture (R. Stallcup, pers. observation; ACR Files).
3. Unknown dates: two observations of individuals on gravel bars below mean tide level at White House Pool on Lagunitas Creek (R. Stallcup, pers. observation).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Wandering Tattler (*Heteroscelus incanus*)



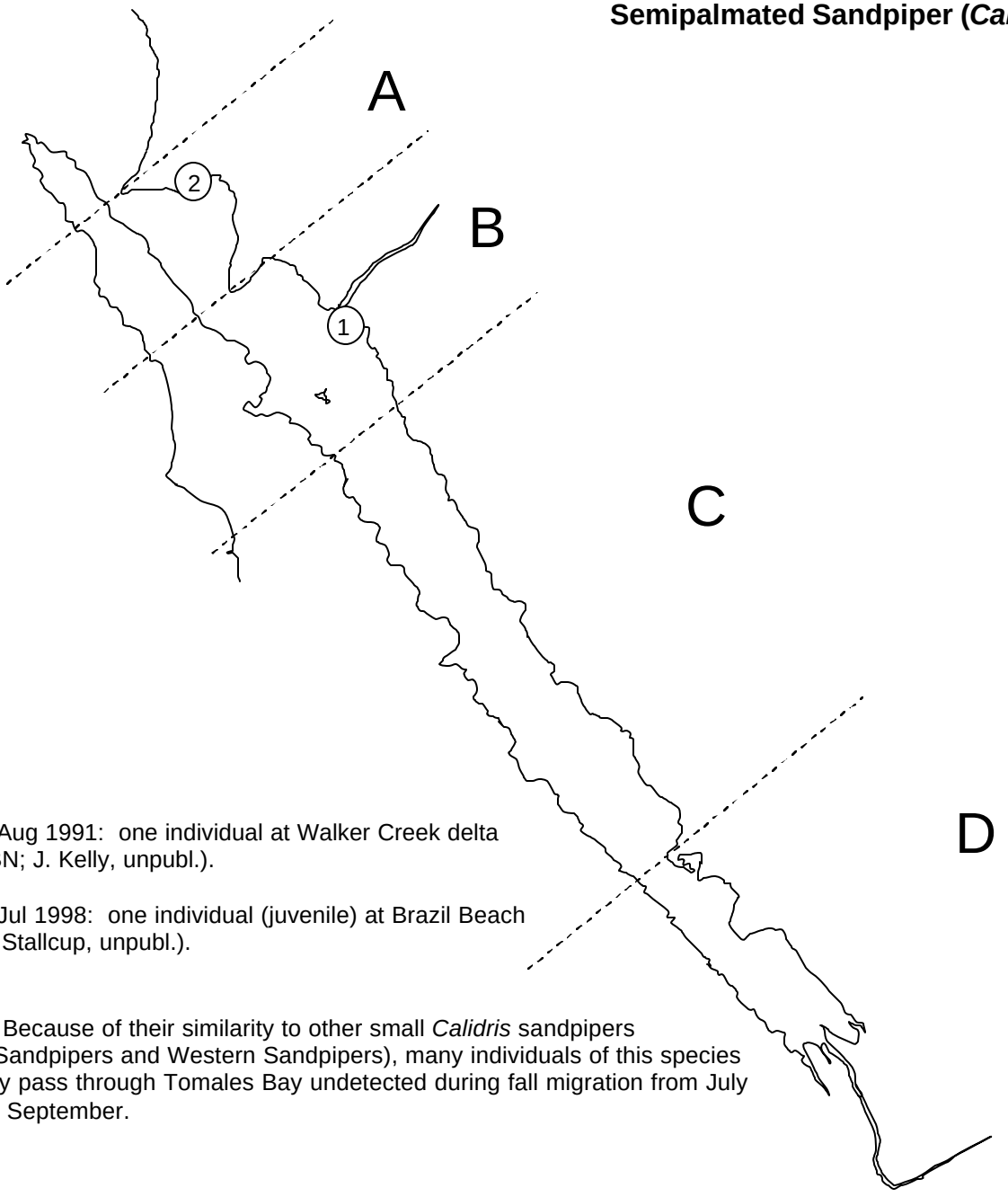
1. 19 Nov 1993: one individual at Cypress Point (observed by John McDonagh and Lew Edmonson; ACR Files).

2. 25 Aug 1998: one individual at Miller County Park (R. Stallcup, unpubl.; ACR Files).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Semipalmated Sandpiper (*Calidris pusilla*)



1. 22 Aug 1991: one individual at Walker Creek delta (ABN; J. Kelly, unpubl.).

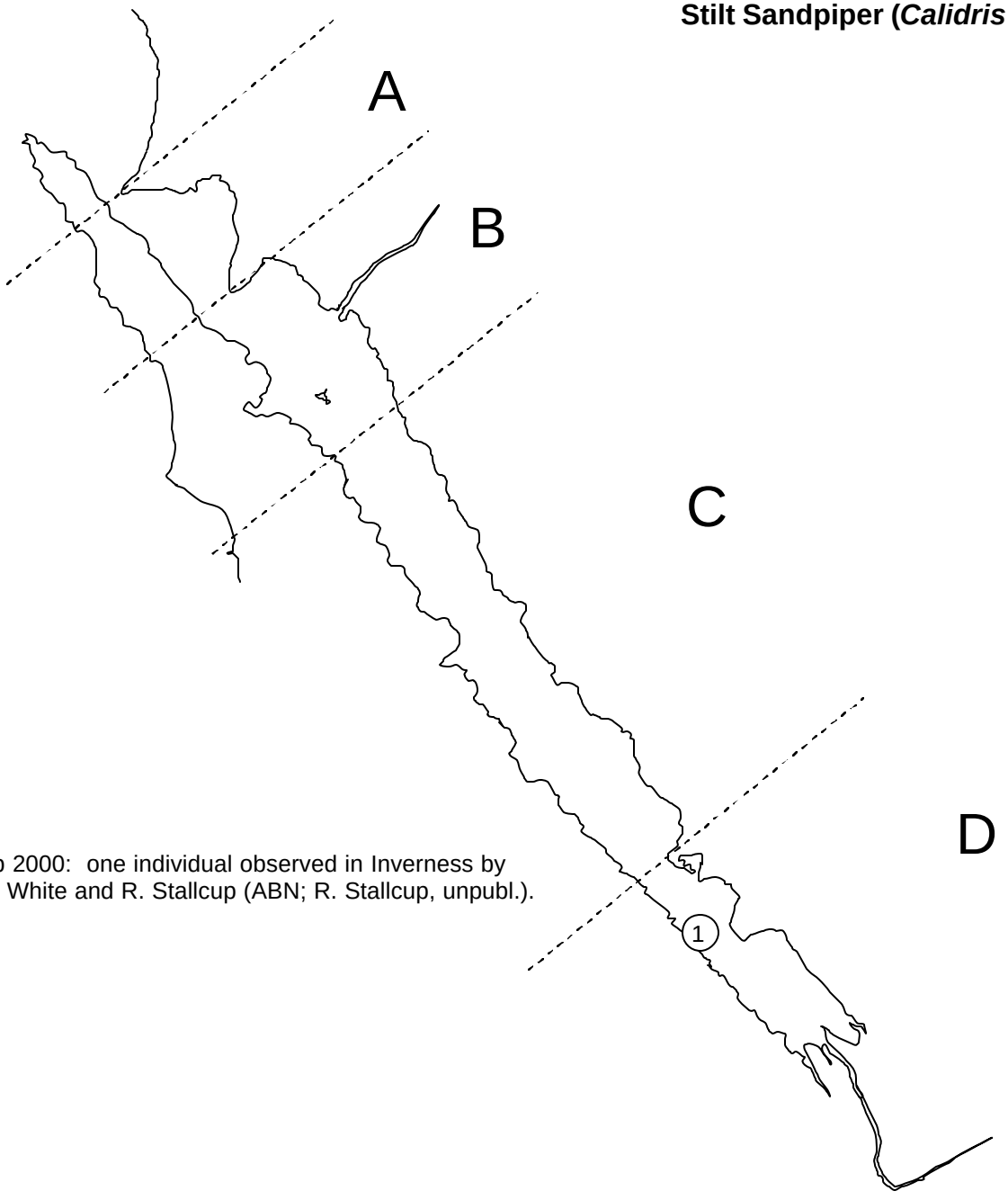
2. 31 Jul 1998: one individual (juvenile) at Brazil Beach (R. Stallcup, unpubl.).

Notes: Because of their similarity to other small *Calidris* sandpipers (Least Sandpipers and Western Sandpipers), many individuals of this species probably pass through Tomales Bay undetected during fall migration from July through September.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Stilt Sandpiper (*Calidris himantopus*)

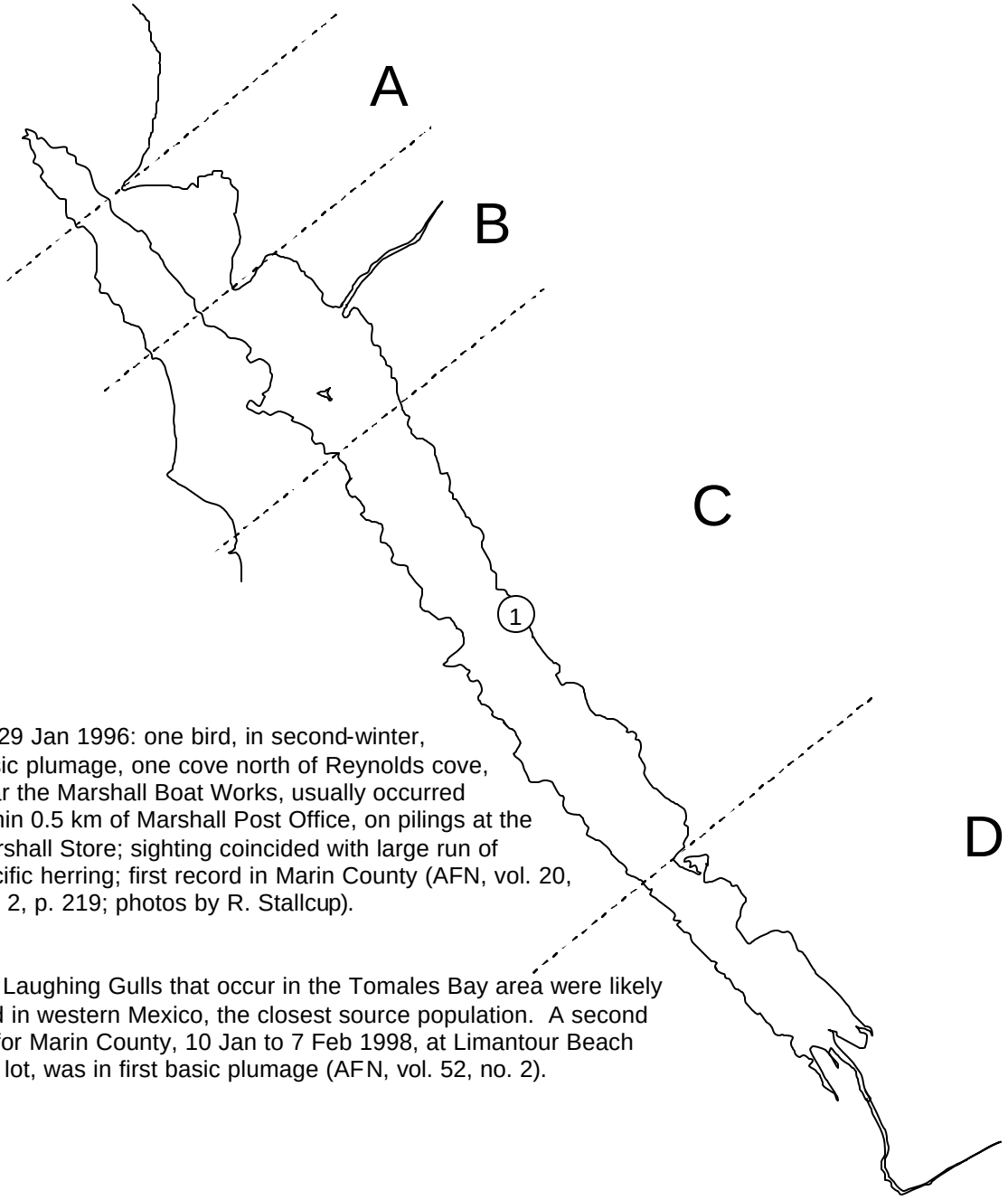


1. Sep 2000: one individual observed in Inverness by Jim White and R. Stallcup (ABN; R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Laughing Gull (*Larus atricilla*)



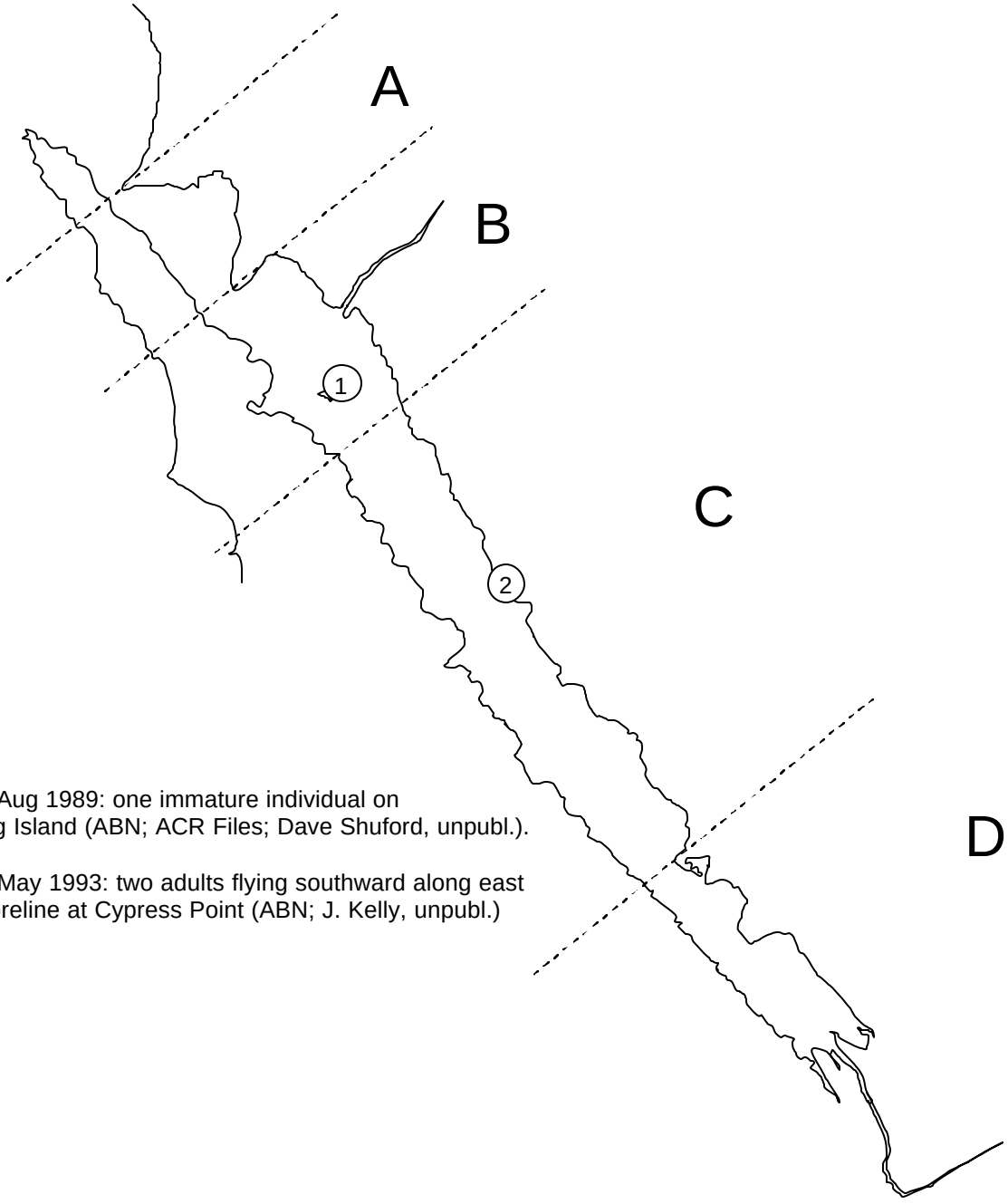
1. 21-29 Jan 1996: one bird, in second-winter, basic plumage, one cove north of Reynolds cove, near the Marshall Boat Works, usually occurred within 0.5 km of Marshall Post Office, on pilings at the Marshall Store; sighting coincided with large run of Pacific herring; first record in Marin County (AFN, vol. 20, No. 2, p. 219; photos by R. Stallcup).

Notes: Laughing Gulls that occur in the Tomales Bay area were likely hatched in western Mexico, the closest source population. A second record for Marin County, 10 Jan to 7 Feb 1998, at Limantour Beach parking lot, was in first basic plumage (AFN, vol. 52, no. 2).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Franklin's Gull (*Larus pipixcan*)



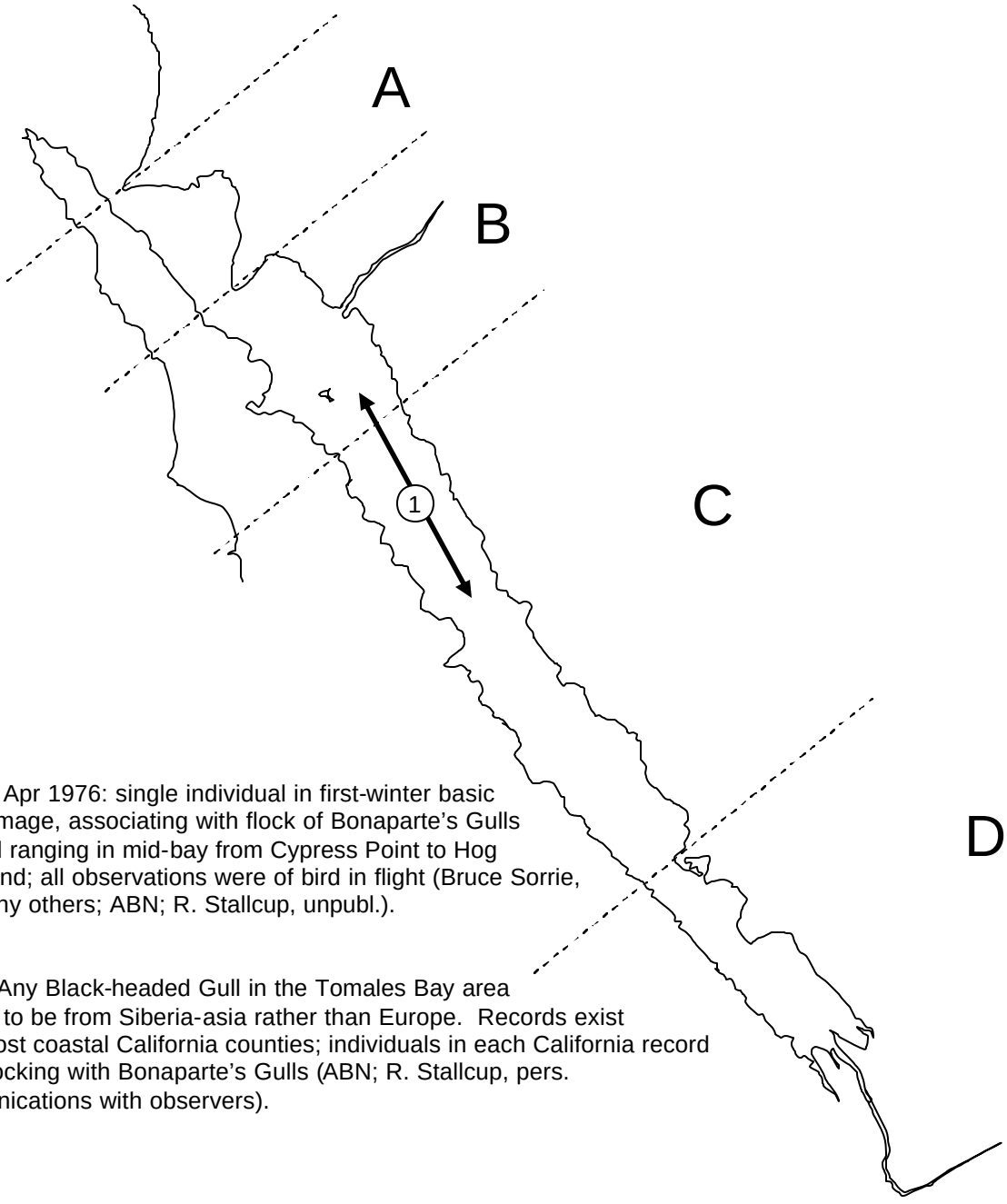
1. 13 Aug 1989: one immature individual on Hog Island (ABN; ACR Files; Dave Shuford, unpubl.).

2. 28 May 1993: two adults flying southward along east shoreline at Cypress Point (ABN; J. Kelly, unpubl.)

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

(Common) Black-Headed Gull (*Larus ridibundus*)



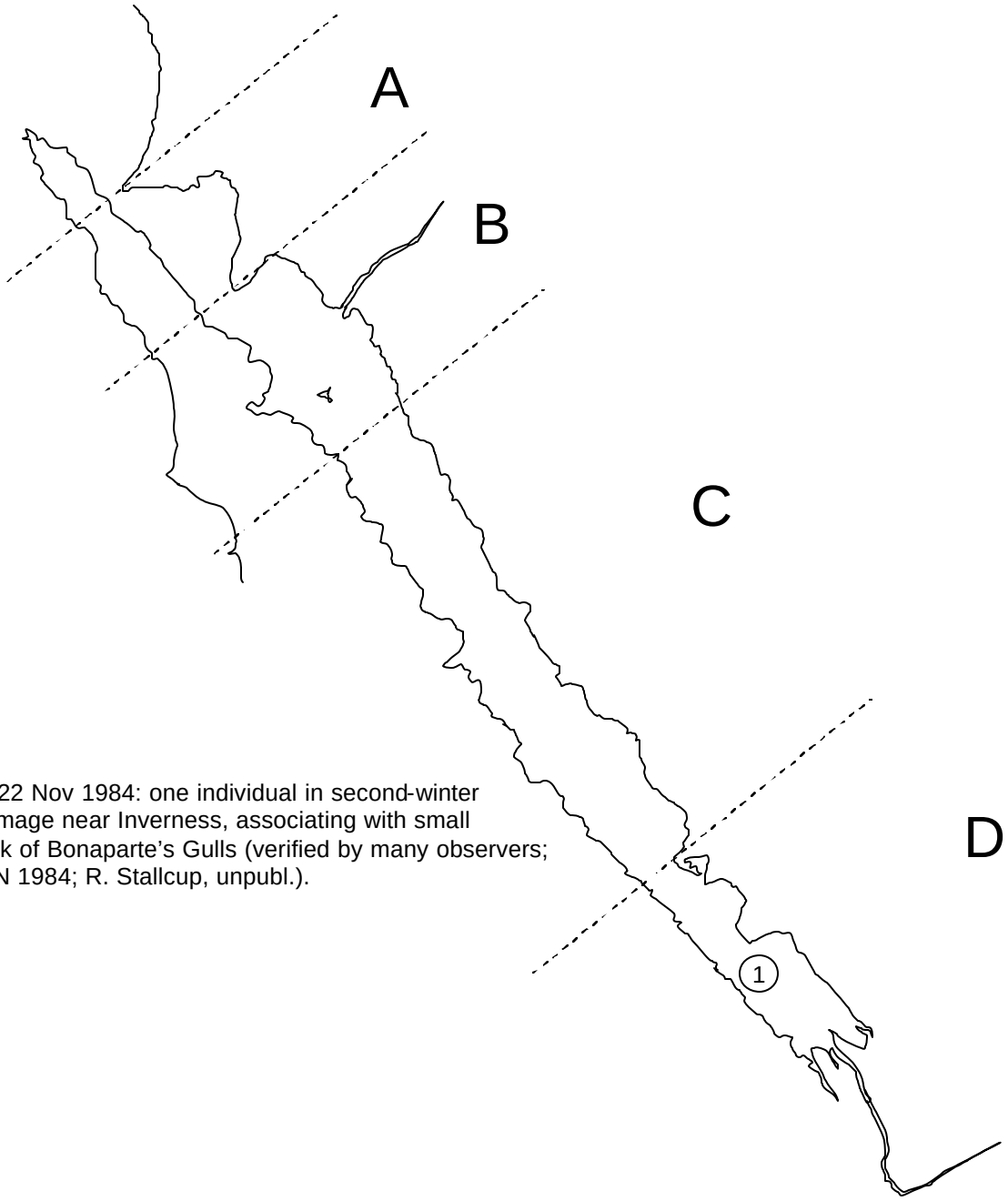
1. 5-8 Apr 1976: single individual in first-winter basic plumage, associating with flock of Bonaparte's Gulls and ranging in mid-bay from Cypress Point to Hog Island; all observations were of bird in flight (Bruce Sorrie, many others; ABN; R. Stallcup, unpubl.).

Notes: Any Black-headed Gull in the Tomales Bay area is likely to be from Siberia-asia rather than Europe. Records exist from most coastal California counties; individuals in each California record were flocking with Bonaparte's Gulls (ABN; R. Stallcup, pers. communications with observers).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Little Gull (*Larus minutus*)

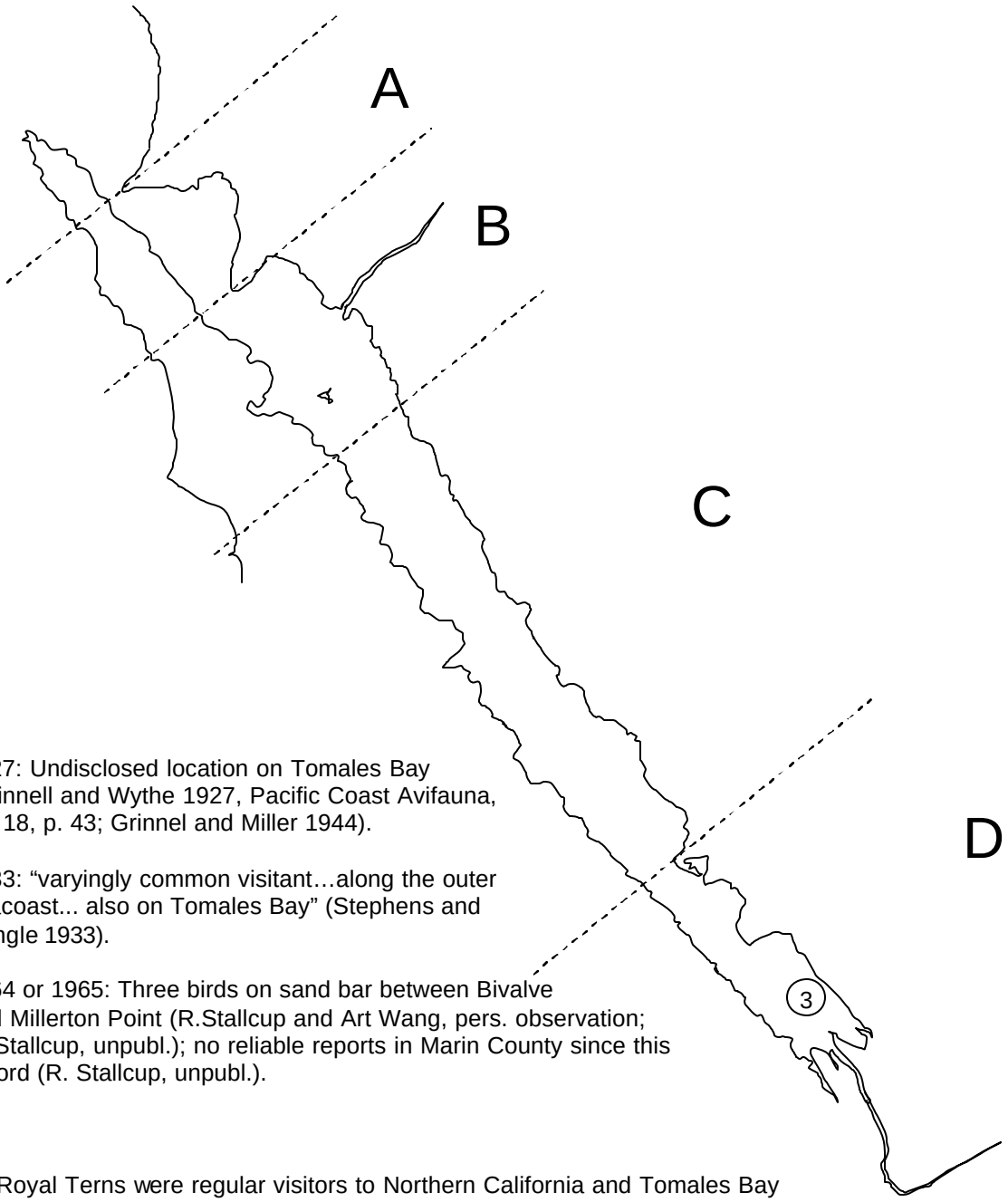


1. 21-22 Nov 1984: one individual in second-winter plumage near Inverness, associating with small flock of Bonaparte's Gulls (verified by many observers; AFN 1984; R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Royal Tern (*Sterna maxima*)



1. 1927: Undisclosed location on Tomales Bay (Grinnell and Wythe 1927, Pacific Coast Avifauna, no. 18, p. 43; Grinnel and Miller 1944).

2. 1933: “varyingly common visitant…along the outer seacoast... also on Tomales Bay” (Stephens and Pringle 1933).

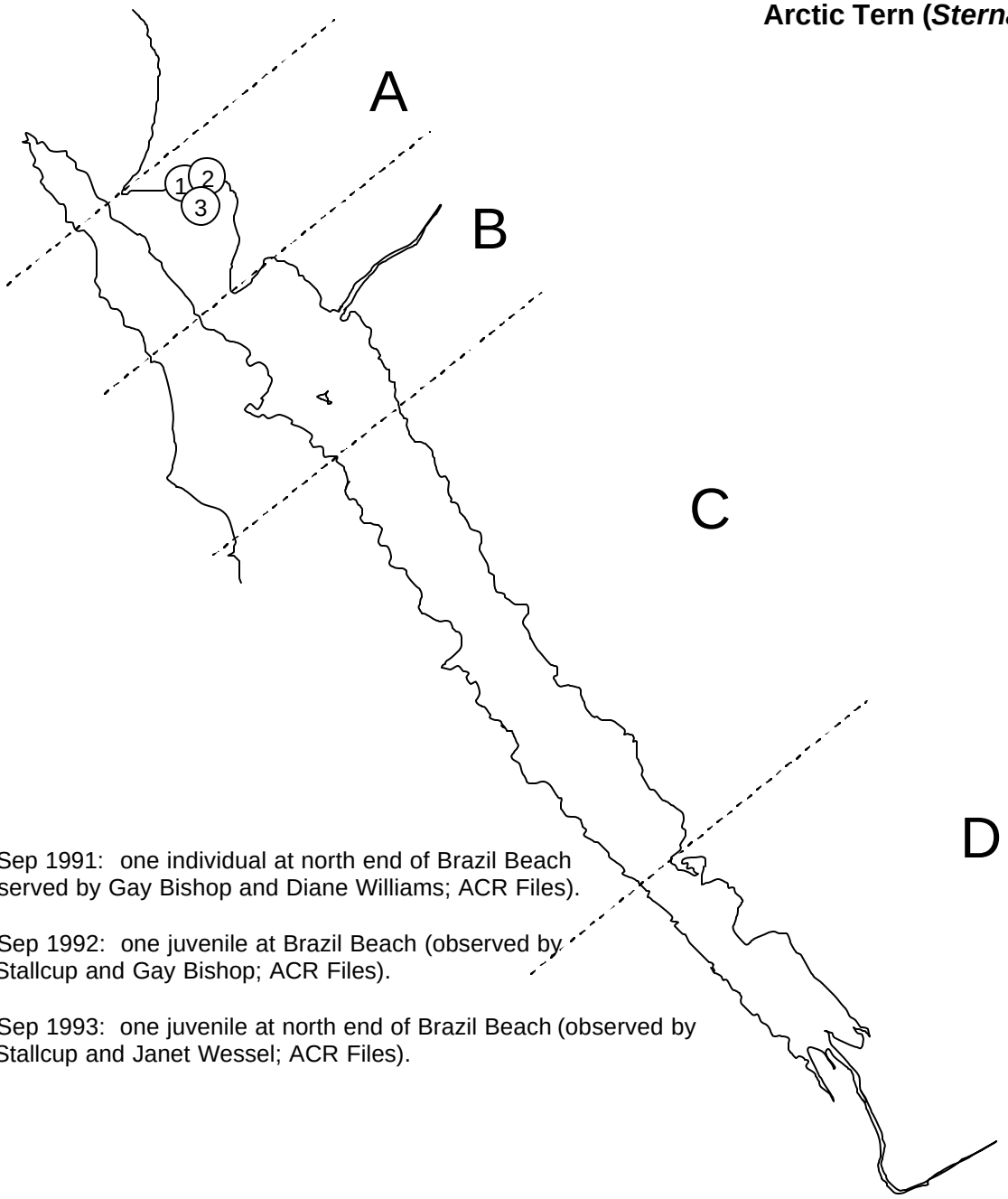
3. 1964 or 1965: Three birds on sand bar between Bivalve and Millerton Point (R.Stallcup and Art Wang, pers. observation; R. Stallcup, unpubl.); no reliable reports in Marin County since this record (R. Stallcup, unpubl.).

Notes: Royal Terns were regular visitors to Northern California and Tomales Bay prior to 1960, but currently have a different distribution, possibly associated with the collapse of Pacific Sardine populations during the 1940’s (R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Arctic Tern (*Sterna paradisaea*)



1. 10 Sep 1991: one individual at north end of Brazil Beach (observed by Gay Bishop and Diane Williams; ACR Files).

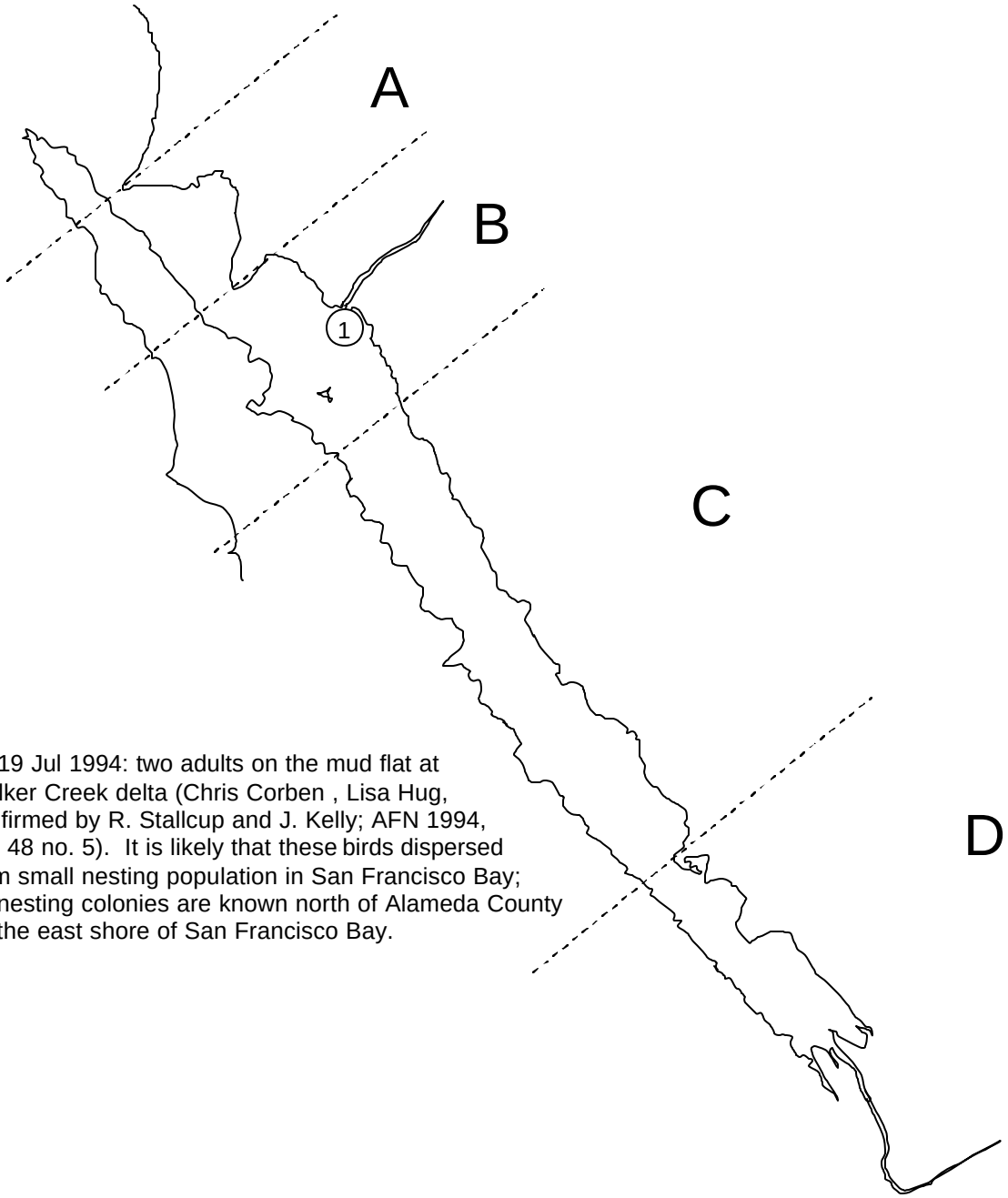
2. 11 Sep 1992: one juvenile at Brazil Beach (observed by R. Stallcup and Gay Bishop; ACR Files).

3. 15 Sep 1993: one juvenile at north end of Brazil Beach (observed by R. Stallcup and Janet Wessel; ACR Files).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Least Tern (*Sterna antillarum*)

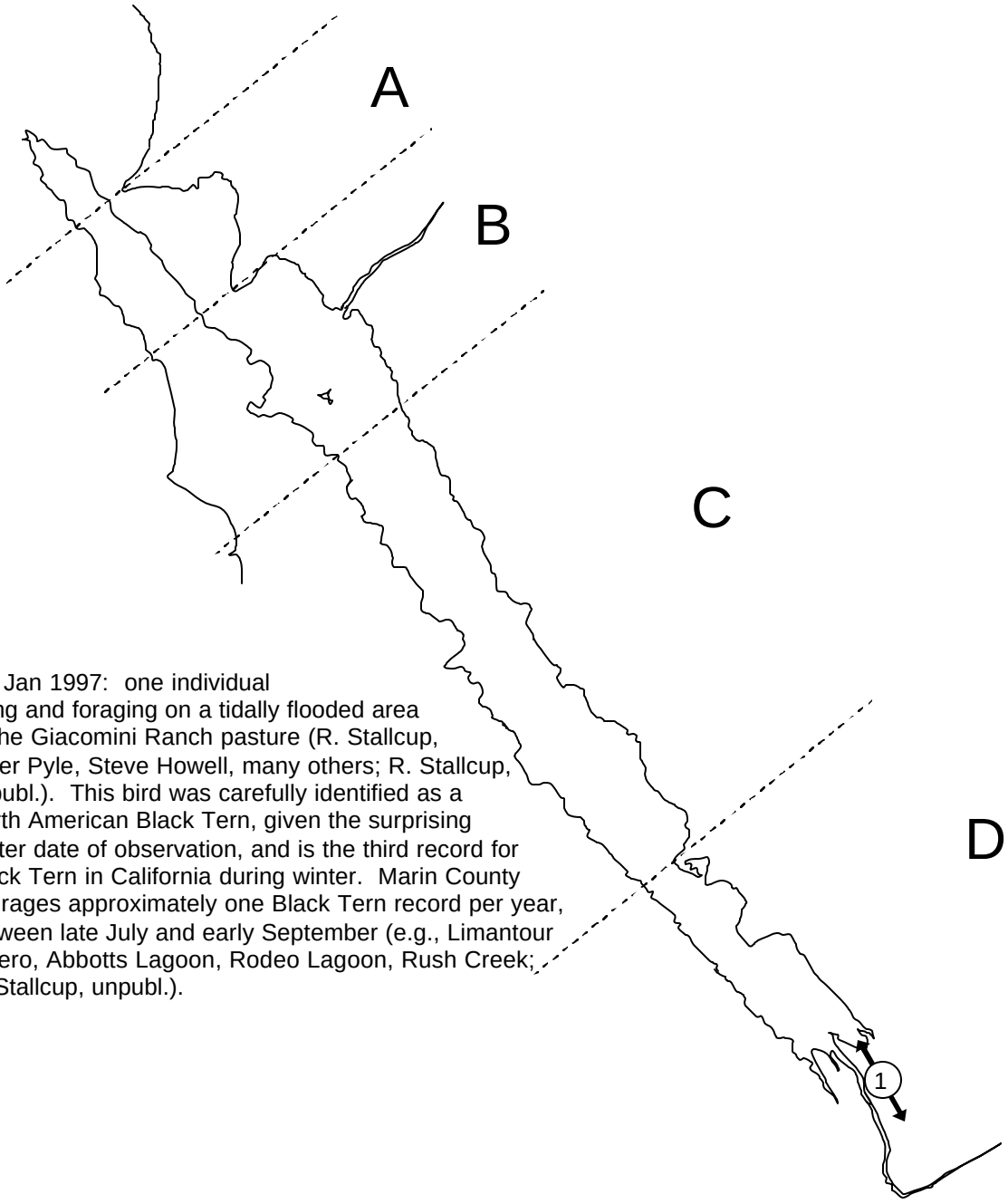


1. 18-19 Jul 1994: two adults on the mud flat at Walker Creek delta (Chris Corben , Lisa Hug, confirmed by R. Stallcup and J. Kelly; AFN 1994, vol. 48 no. 5). It is likely that these birds dispersed from small nesting population in San Francisco Bay; no nesting colonies are known north of Alameda County on the east shore of San Francisco Bay.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Black Tern (*Chlidonias niger*)

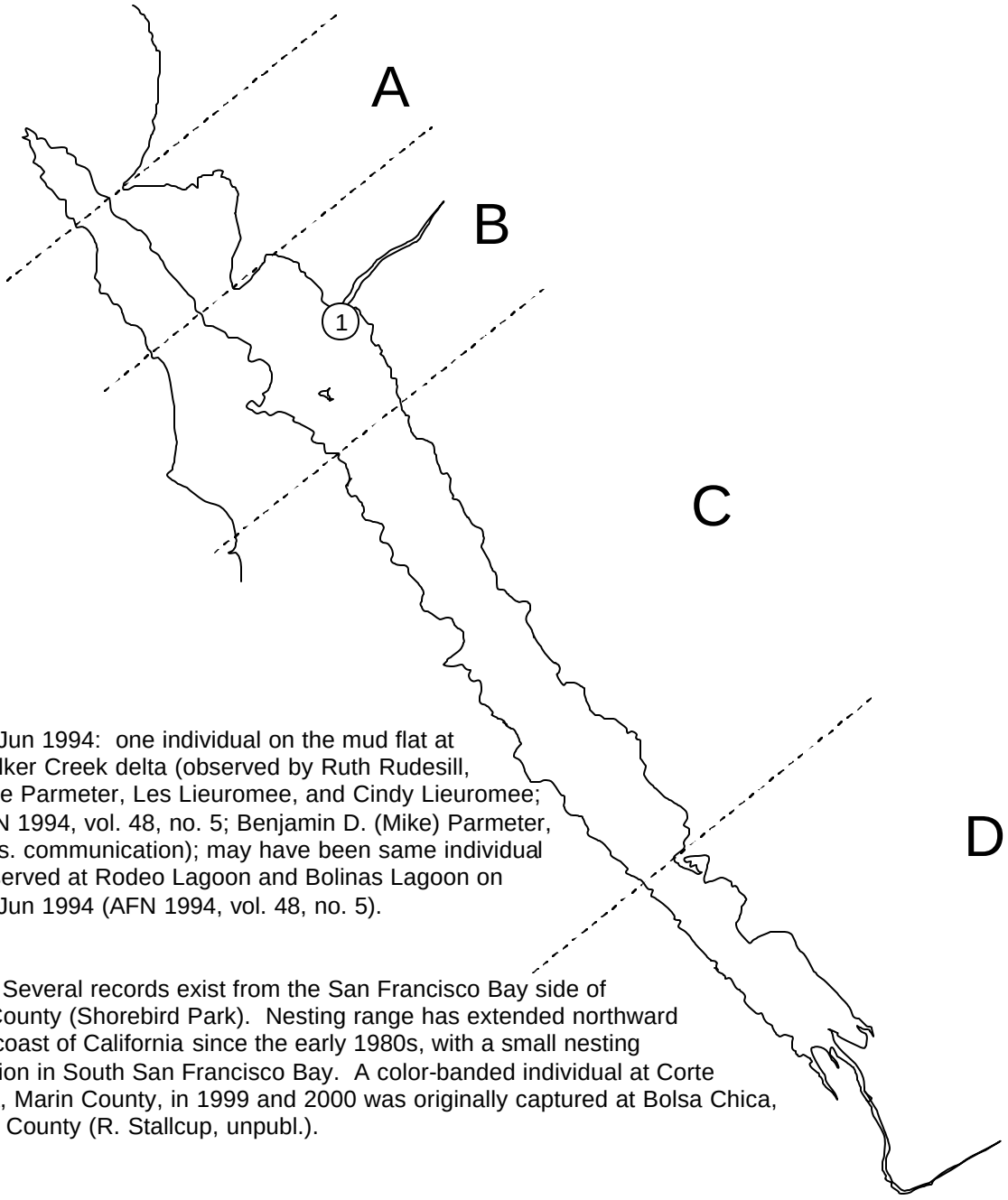


1. 3-4 Jan 1997: one individual flying and foraging on a tidally flooded area of the Giacomini Ranch pasture (R. Stallcup, Peter Pyle, Steve Howell, many others; R. Stallcup, unpubl.). This bird was carefully identified as a North American Black Tern, given the surprising winter date of observation, and is the third record for Black Tern in California during winter. Marin County averages approximately one Black Tern record per year, between late July and early September (e.g., Limantour Estero, Abbotts Lagoon, Rodeo Lagoon, Rush Creek; R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Black Skimmer (*Rynchops niger*)



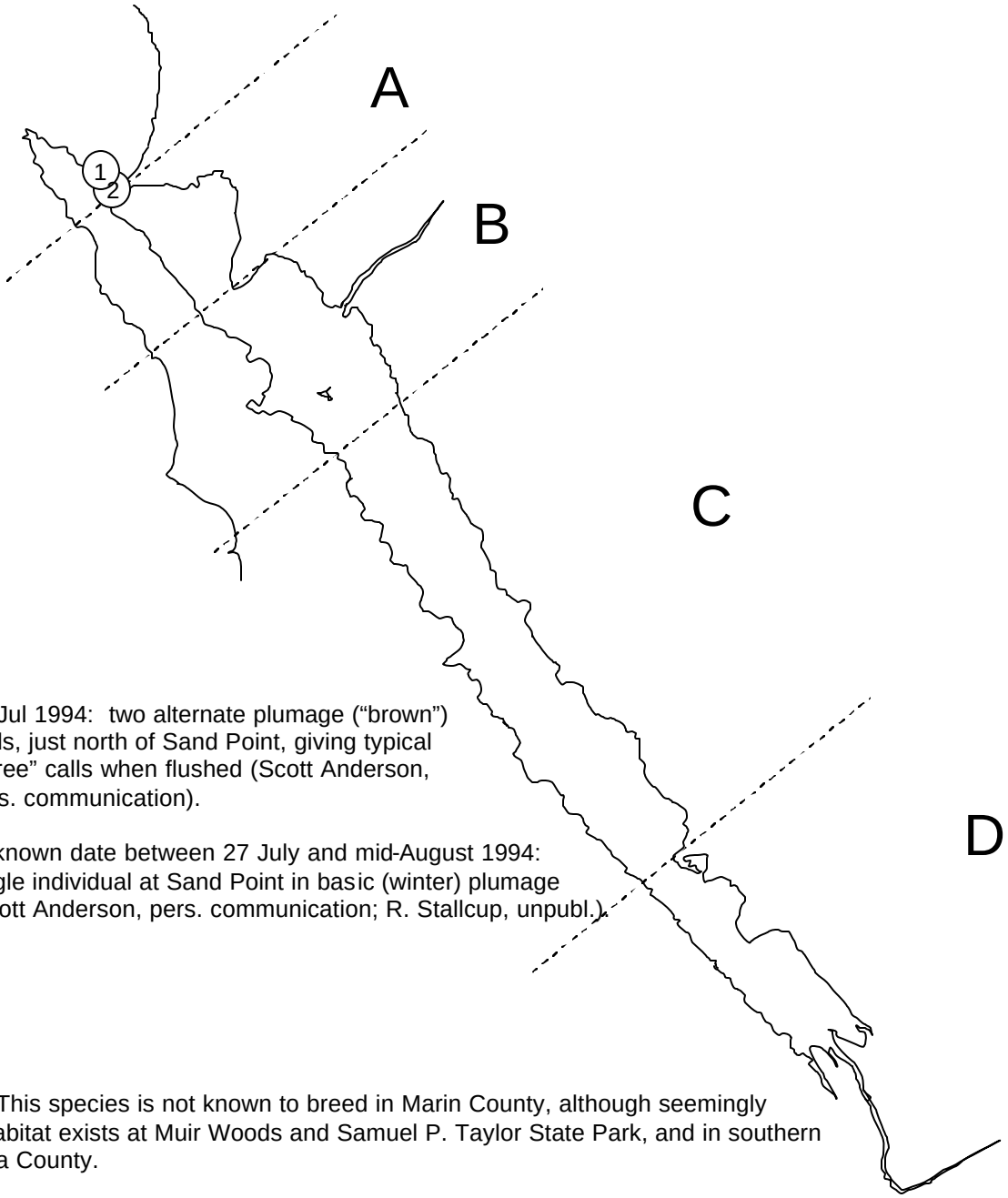
1. 23 Jun 1994: one individual on the mud flat at Walker Creek delta (observed by Ruth Rudesill, Mike Parmeter, Les Lieuromee, and Cindy Lieuromee; AFN 1994, vol. 48, no. 5; Benjamin D. (Mike) Parmeter, pers. communication); may have been same individual observed at Rodeo Lagoon and Bolinas Lagoon on 22 Jun 1994 (AFN 1994, vol. 48, no. 5).

Notes: Several records exist from the San Francisco Bay side of Marin County (Shorebird Park). Nesting range has extended northward up the coast of California since the early 1980s, with a small nesting population in South San Francisco Bay. A color-banded individual at Corte Madera, Marin County, in 1999 and 2000 was originally captured at Bolsa Chica, Orange County (R. Stallcup, unpubl.).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Marbled Murrelet (*Brachyramphus marmoratus*)



1. 26 Jul 1994: two alternate plumage ("brown") birds, just north of Sand Point, giving typical "skree" calls when flushed (Scott Anderson, pers. communication).

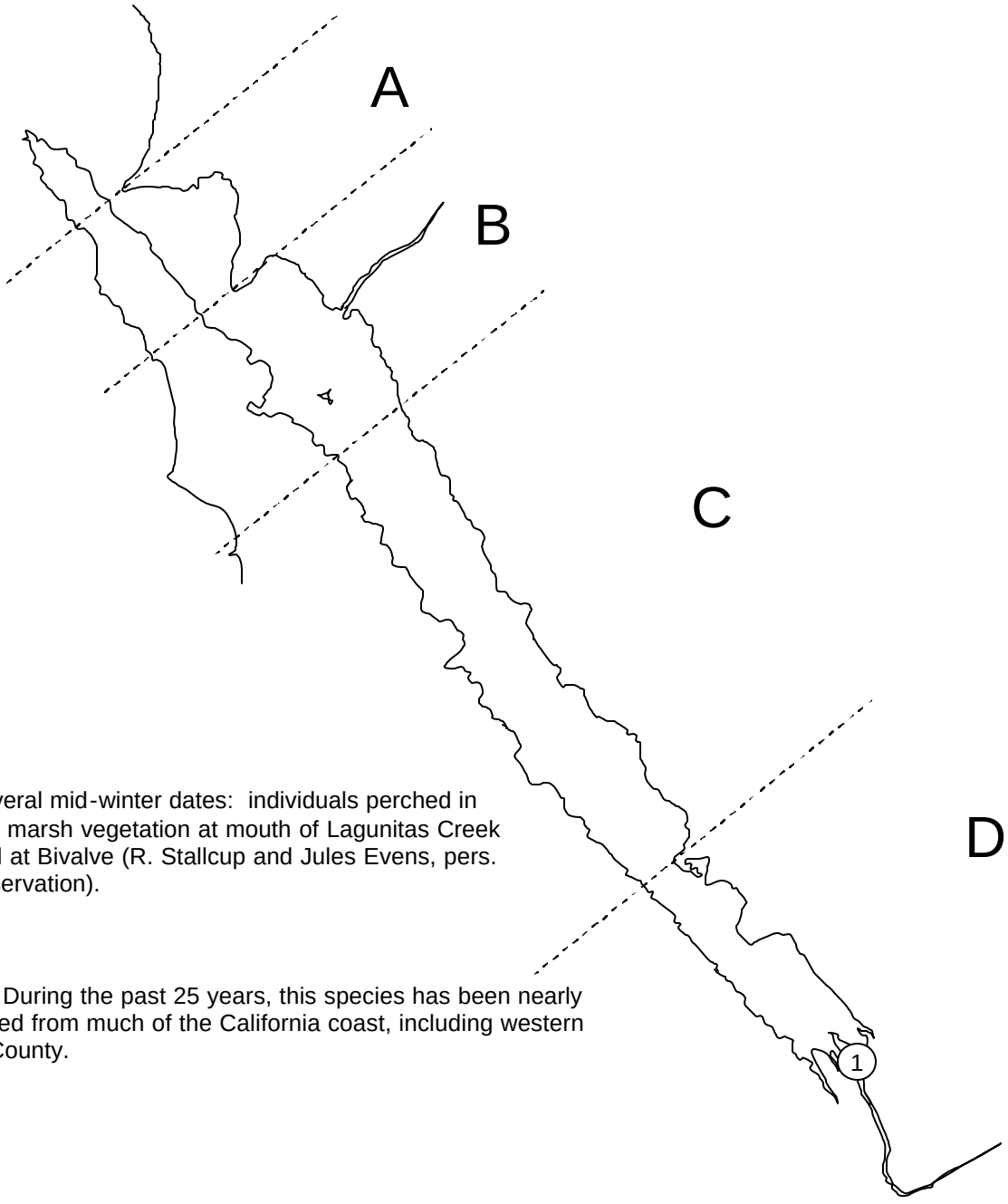
2. Unknown date between 27 July and mid-August 1994: single individual at Sand Point in basic (winter) plumage (Scott Anderson, pers. communication; R. Stallcup, unpubl.).

Notes: This species is not known to breed in Marin County, although seemingly good habitat exists at Muir Woods and Samuel P. Taylor State Park, and in southern Sonoma County.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Loggerhead Shrike (*Lanius ludovicianus*)

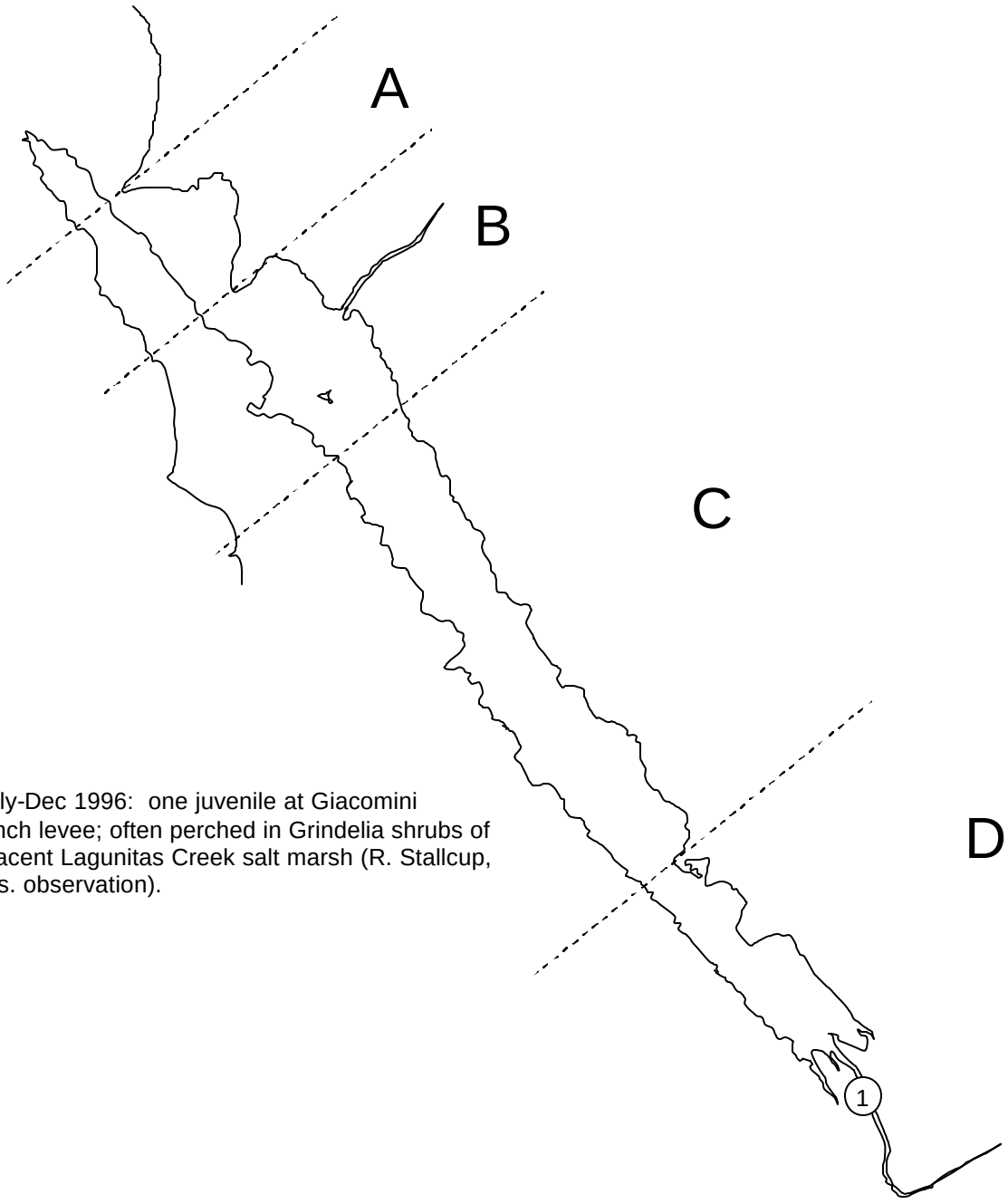


1. Several mid-winter dates: individuals perched in salt marsh vegetation at mouth of Lagunitas Creek and at Bivalve (R. Stallcup and Jules Evens, pers. observation).

Notes: During the past 25 years, this species has been nearly extirpated from much of the California coast, including western Marin County.

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY
(See Table 6 for sub-area occurrences of other bird species.)

Northern Shrike (*Lanius excubitor*)

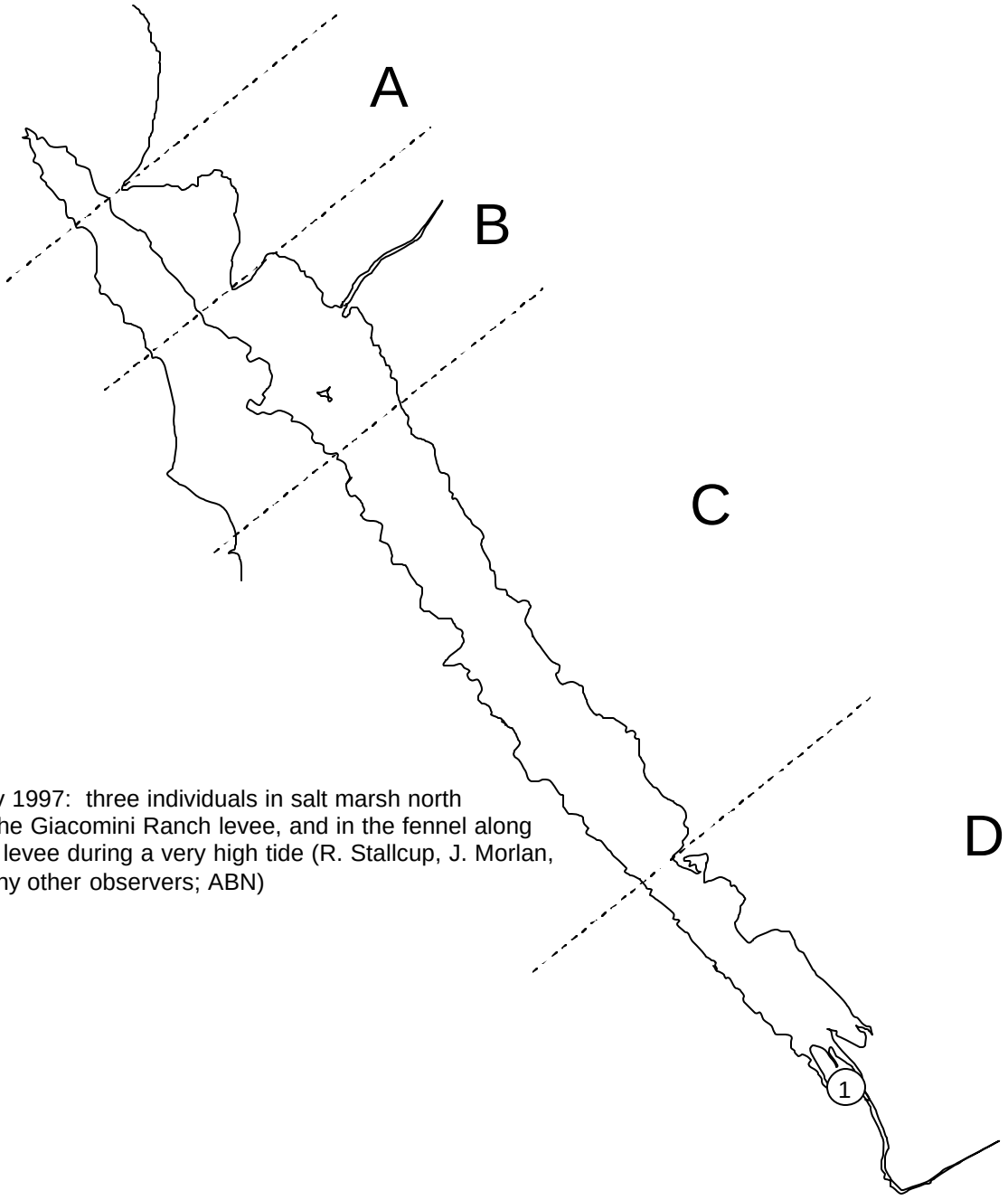


1. Early-Dec 1996: one juvenile at Giacomini Ranch levee; often perched in Grindelia shrubs of adjacent Lagunitas Creek salt marsh (R. Stallcup, pers. observation).

APPENDIX B: RECORDS OF CASUAL-TO-EXTREMELY RARE BIRD SPECIES ON TOMALES BAY

(See Table 6 for sub-area occurrences of other bird species.)

Nelson's Sharp-Tailed Sparrow (*Ammodramus nelsoni*)



1. Nov 1997: three individuals in salt marsh north of the Giacomini Ranch levee, and in the fennel along the levee during a very high tide (R. Stallcup, J. Morlan, many other observers; ABN)