Appendix 1

Analysis of aerial sightings data to investigate trends in sightings of kahawai

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Overall objective

To review aerial spotting data to determine the presence of trends in the overall availability (i.e., abundance at the surface) of kahawai.

1. Background

Information with which the abundance of kahawai can be characterised is limited. Aerial sightings data are collected by pilots supporting the domestic purse-seine operation. Data collection is opportunistic, which makes their use in characterising abundance difficult. However, by assuming that regular sightings under a variety of conditions provide representative information on some proportion of the stock of the species of interest, trends in its presence at the surface provides information on availability to the fishery, which can be interpreted as a rough index of relative abundance over time. This is the first step in an approach that is being developed elsewhere, in which the objective is to produce stock indices of schooling pelagic species standardised using a variety of environmental and fishery-related predictor variables. Standardisation was not included here.

2. Method

Several measures of availability were considered. A choice was made based on the ability of the estimator to provide some level of robustness by incorporating measures of flying effort into the algorithm, and, because of the short timeframe over which the work was to be completed, was not a re-expression of the same data. Thus, number of schools was used for estimating tonnage, but, because of uncertainties about varying school size, was abandoned as an independent measure of availability. The measures chosen were:

1. Annual mean TPH (tonnes sighted per hour of flying effort).
2. The number of days during the calendar year that sightings of four different size categories (smaller than 100 t, between 100 and 500 t, between 500 and 1000 t, and larger than 1000 t) were recorded; these values were expressed as a ratio of the total annual flying time (i.e., search effort) within the region of interest.

3. Estimating measures of availability

Sightings of mixed and pure (monospecific) kahawai schools were extracted from the MFish aerial sightings database (*aer _sight*). Within the database the basic unit is the sighting. Each sighting is summarised as follows:

- Species composition - species comprising the schools of the sighting; all schools in a sighting comprise the same species composition.
- Number of schools.
- Minimum school size - the pilot's tonnage estimate of the smallest school in the sighting.
- Maximum school size - the pilot's tonnage estimate of the largest school in the sighting.
- Location - the half-degree square in which the group of schools comprising the sighting was located.
- Time of sighting - the time the sighting was made (24 h clock).
- The time elapsed between takeoff and the time the sighting was made.
- An index relating all sightings within each flight.

Previous analysis has shown that not all flying time in a flight is search effort. For kahawai, 52% of sightings occur within the first 18 min of the flight (Taylor in press). Based on this information, only sightings of kahawai made within the first 1 h of the flight were used in estimating individual values of TPH. This provided sightings over a period during which most flying is dedicated to searching for fish.

Total tonnage in the sighting is estimated as the geometric mean of the minimum and maximum school sizes in the sighting, multiplied by the number of schools in the sighting. Thus, TPH during each flight was estimated as the simple sum of the tonnage of kahawai from all sightings made within the first hour of the flight. Annual mean TPH was estimated as the mean TPH for all flights during the defined season (see below), within the region of interest.

For the second measure of availability, the size of all sightings was calculated using the geometric mean. The sightings were then selected according to the four size categories as counts within the regions of interest throughout the entire calendar year - to ensure maximum possible representation of all of the size classes no seasonal limit was used. To provide the most robust index possible, total annual counts were divided by a measure of the total flying time during each year in the region of interest, to provide a ratio of the count to the flying effort.

Flying effort is recorded within the database as 10-15 min periods of flying within a grid square. For each flight, these time blocks are recorded as counts, usually for a number of grid squares (Figure 1). For example, a flight (or group of flights) from Tauranga to the Cavalli Islands, returning to Tauranga will be represented by an extensive array of grid squares.

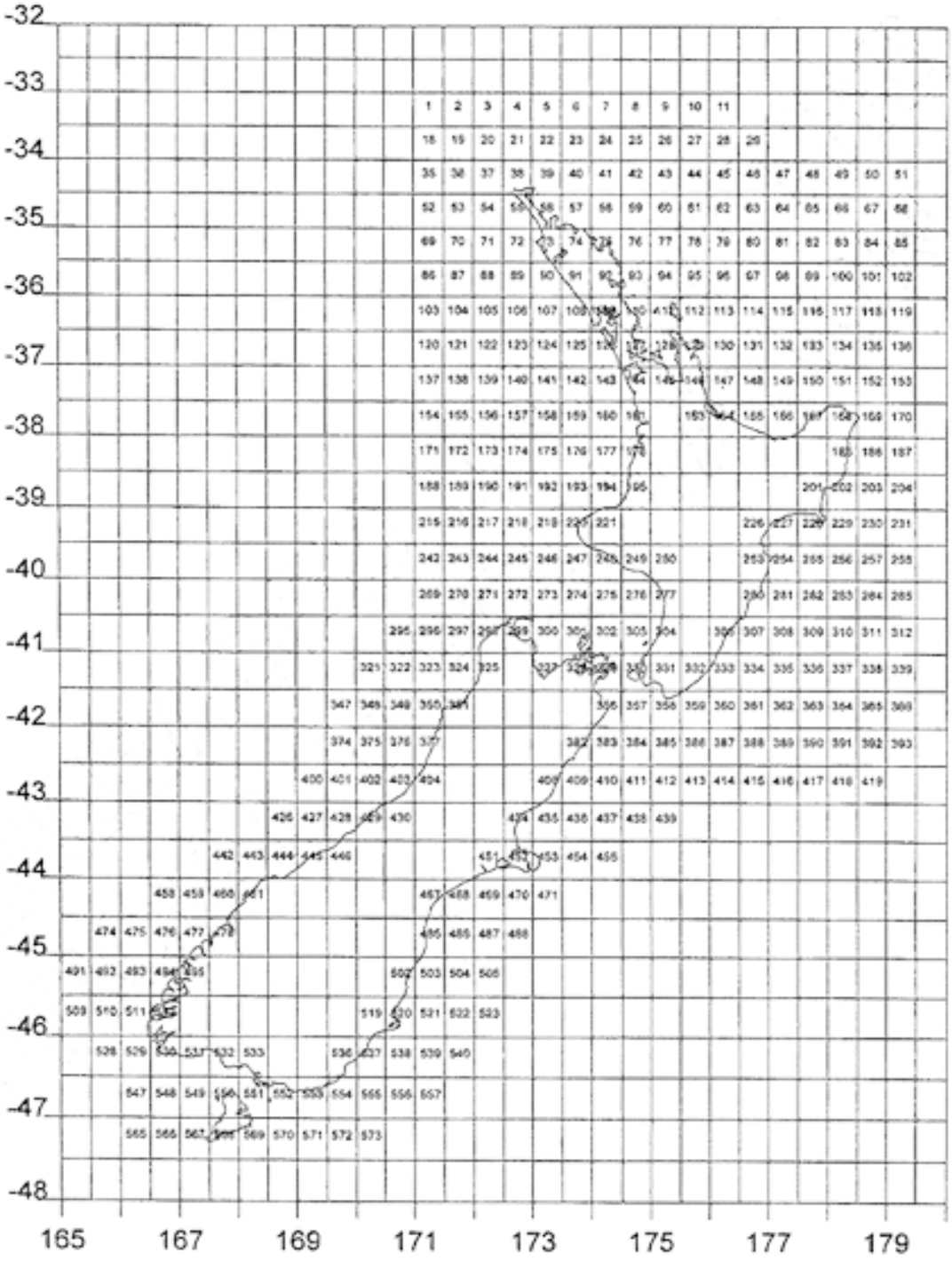

Figure 1: Half degree grid squares used in spatial coding of aerial sightings data.

Sightings were aggregated spatially as follows:

- East Northland - grids 38, 39, 56, 57, 75, 76, 93.
- Bay of Plenty - grids 129, 130, 146, 147, 164, 165, 166.
- Hawke Bay - grids 202, 227,228,229,254,280, 281,306, 307, 332, 333

2.2 Determining seasonality

Seasonality can be important in the data. When a particular species is being targeted, sightings of other species are recorded, but bias may arise from pilots not checking schools at the limit of their vision, which they can ignore after identifying them as not being the target species. Thus, the most reliable data for a species are recorded during periods when it is being targeted.

Obviously, the best data for identifying target periods records are the records of the fishing company. However, this information appears to seldom be available. The best alternative is to identify periods in the MFish catch and effort data when high catch rates of the species of interest occurred and define this as the fishing season for that species. Further credence is provided where the catch data suggest similar periods between years. This approach was adopted for the present analysis.

2.3 Exploratory data analysis

Following extraction of the data from the database, some simple exploratory analysis was carried out to determine the presence of erroneous data points or outliers. Because time was relatively short these were not extensive, consisting of plots of minimum tonnage and maximum tonnage and examination of the distribution of estimates of school number by pilot.

2.4 Pure and mixed schools

Kahawai is recorded in the data as occurring mixed in schools with a number of other species. Including mixed schools in the analysis is problematic however, because only total size is available - no information is available on the amount of the various species comprising a mixed school. Previous preliminary analysis has suggested that mixed schools of some species occur seasonally. The data were therefore examined to determine the extent of these factors with respect to kahawai, and to determine whether data from mixed school should be included in the analysis.

3. Results

3.1 Exploratory data analysis

Examination of minimum and maximum tonnage showed that, in some cases, maximum tonnage was smaller than minimum tonnage (Figure 2); these records were omitted from the final dataset.

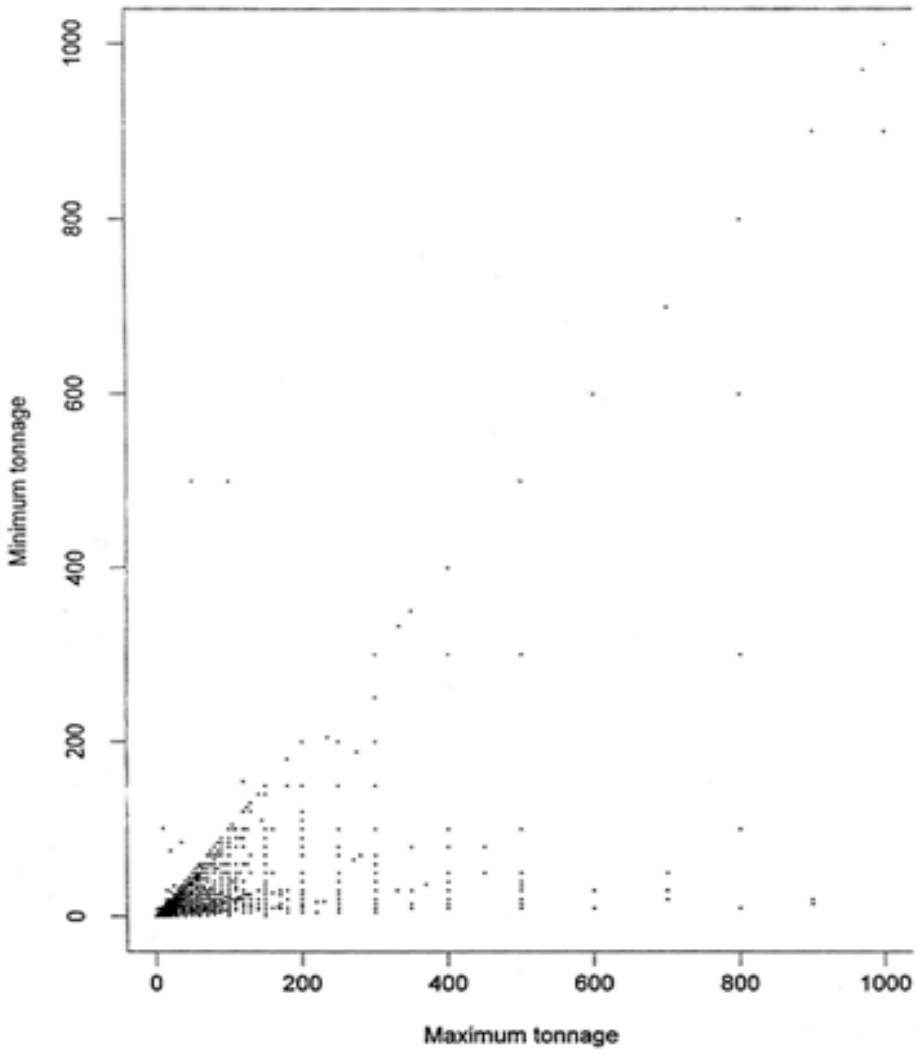

Figure 2: Exploratory data analysis: plot of minimum tonnage on maximum tonnage for kahawai.

An examination of school number showed some instances of very high school counts, but these were recorded by a number of different pilots and, for this analysis at least, records containing them were included in the analysis.

3.2 Seasonality

The spatio-temporal distribution of kahawai catch in the purse-seine fishery since 1989 is summarised in Appendix A. Possible seasonal periods are highlighted in grey. The pattern in statistical area 9 (BOP) was used for TPH estimates for the areas analysed (east Northland, BOP, and Hawke Bay). No seasonal restriction was used for the all-areas analysis.

3.3 Pure and mixed schools

The proportion of kahawai schools that were mixed is shown in Table 1. Although the proportion was high in some months, it is generally low between May and September, the months defined as the main fishing season in the regions analysed.

Table 1: Proportion of schools in which kahawai were observed mixed with other species, expressed as a proportion of the total number of schools (mixed and pure) in which kahawai were observed, by year and month; data covers all areas.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976							0.13	0.14	0.00	0.13	0.13	0.06
1977	0.33	0.00	0.20	0.60	0.30	0.19	0.17	0.29	0.02	0.12	0.09	0.13
1978	0.18	0.07	0.10	0.28	0.09	0.24	0.11	0.15	0.15	0.15	0.10	0.12
1979	0.00	0.00	0.00	0.25	0.28	0.32	0.47	0.14	0.29	0.09	0.14	0.23
1980	0.33	0.45	0.26	0.19	0.26	0.19	0.04	0.09	0.07	0.18	0.42	0.31
1981	0.35	0.66	0.46	0.45	0.46	0.11	0.04	0.05	0.20	0.09	0.27	0.24
1982	0.37	0.12	0.68	0.37	0.25	0.06	0.00	0.10	0.07	0.11	0.09	0.27
1983	0.26	0.24	0.11	0.20	0.24	0.27	0.03	0.06	0.10	0.13	0.20	0.33
1984	0.33	0.40	0.49	0.35	0.20	0.05	0.06	0.18	0.23	0.08	0.22	0.15
1985	0.41	0.50	0.29	0.20	0.25	0.15	0.04	0.07	0.07	0.34	0.25	0.32
1986	0.27	0.44	0.58	0.44	0.30	0.24	0.00	0.14	0.12	0.16	0.31	0.27
1987	0.40	0.45	0.25	0.30	0.28	0.28	0.08	0.05	0.20	0.07	0.22	0.24
1988	0.20	0.20	0.37	0.19	0.20	0.18	0.15	0.07	0.09	0.07	0.15	0.24
1989	0.32	0.44	0.32	0.26	0.40	0.12	0.00	0.03	0.13	0.23	0.34	0.16
1990	0.21	0.33	0.54	0.38	0.34	0.18	0.00	0.05	0.12	0.12	0.34	0.21
1991	0.50	0.59	0.37	0.46	0.31	0.12	0.17	0.30	0.20	0.20	0.19	0.47
1992	0.40	0.35	0.20	0.10	0.24	0.07	0.02	0.03	0.11	0.15	0.20	0.15
1993	0.24	0.19	0.23	0.00	0.22	0.06	0.10	0.00	0.17	0.18	0.23	0.16
1994	0.40	0.21	0.08	0.29	0.31	0.27	0.11	0.00	0.09	0.10	0.18	0.19
1995	0.13	0.33	0.34	0.33	0.62	0.16	0.08	0.09	0.07	0.22	0.00	0.19
1996	0.35	0.27	0.14	0.19	0.38	0.13	0.25	0.00	0.13	0.44	0.22	0.04
1997	0.37	0.13	0.14	0.16	0.15	0.00	0.06	0.07	0.14	0.18	0.20	0.15
1998	0.25	0.11	0.00	0.00	0.09	0.09	0.20	0.03	0.21	0.23	0.13	0.34
1999	0.57	0.22	0.22	0.38	0.29	0.22	0.12	0.27	0.13	0.17	0.31	0.26
2000	0.32	0.19	0.33	0.16	0.36	0.24	0.11	0.04	0.02	0.17	0.27	0.25
2001	0.28	0.19	0.00	0.22	0.00	0.00	0.00	0.04	0.10	0.32	0.25	0.36
2002	0.19	0.38	0.42	0.22	0.00	0.52	0.07	0.04	0.02	0.23	0.40	0.39
2003	0.27	0.39	0.20	0.10	0.00	0.00	0.00	0.00	0.07	0.22	0.17	0.43
Mean proportion	0.31	0.29	0.27	0.26	0.25	0.16	0.09	0.09	0.12	0.18	0.22	0.25
Std deviation	0.12	0.17	0.18	0.14	0.14	0.12	0.10	0.09	0.07	0.09	0.10	0.10

3.4 Tonnes per hour

Varying patterns of mean TPH were evident for the three regions analysed and the full dataset (Figure 3). Generally, no trends were obvious.

3.5 Annual sightings by size class

Plots of this measure are shown in Figure 4.

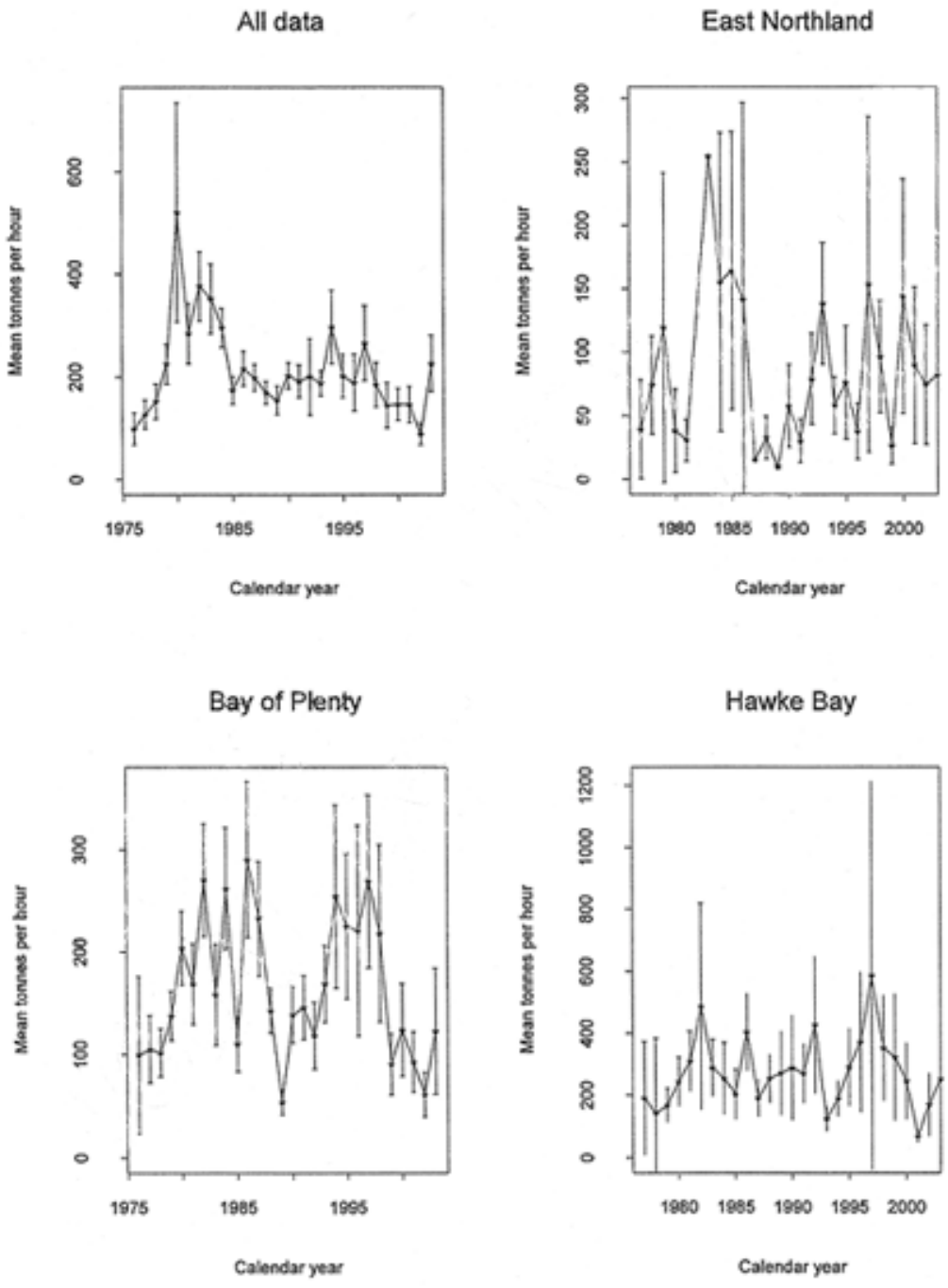

Figure 3: Annual means of tonnes sighted per hour of flying using all data and with seasonal limits for the three regions east Northland, Bay of Plenty and around Hawke Bay; confidence intervals are 2 standard errors (approximately 95% CI). Source: MFish aerial sightings database *aer_sight*.

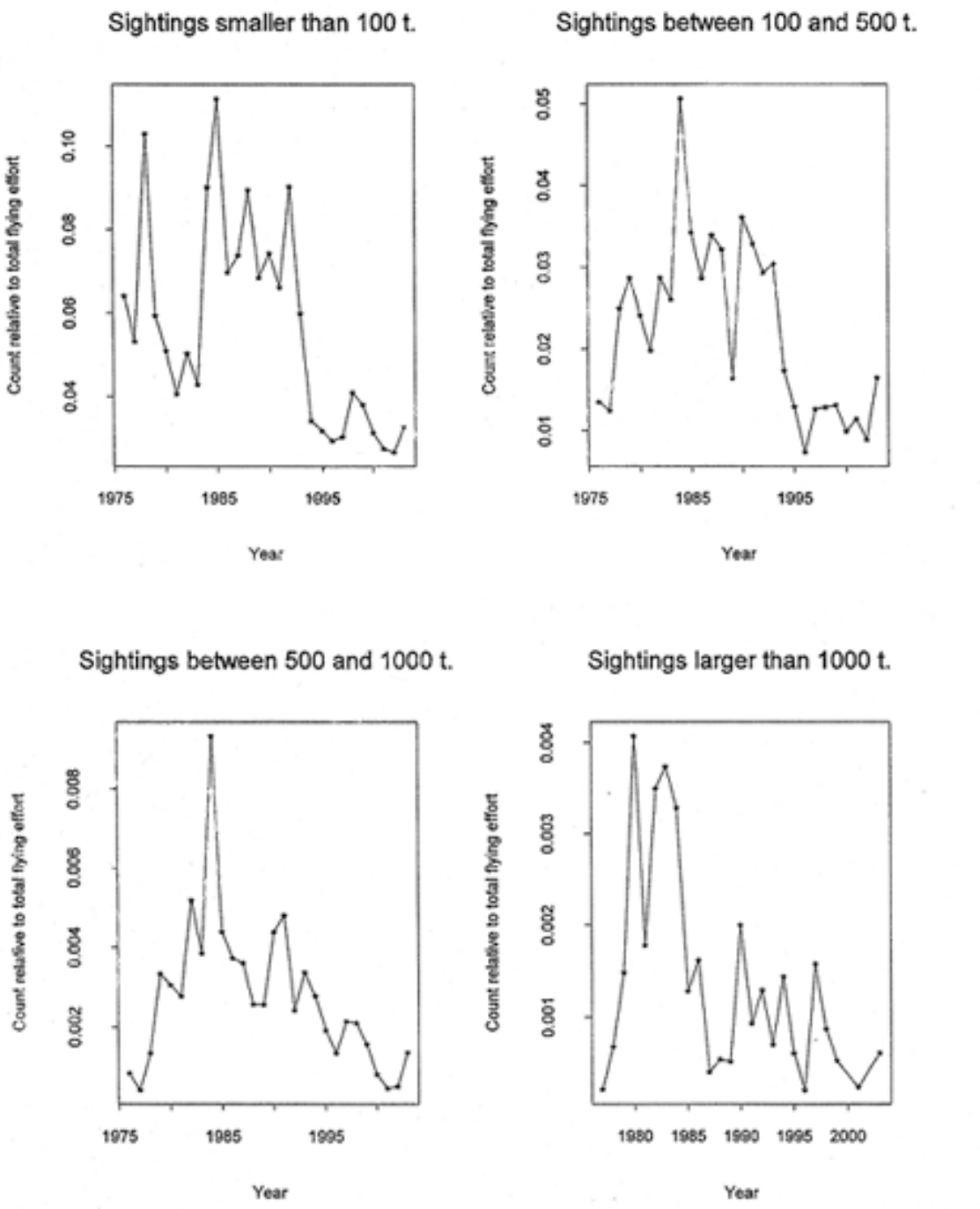

Figure 4a: Annual counts (as a ratio of the total flying effort) of the number of all sightings of kahawai pure (monospecific) schools in all areas within four size classes: smaller than 100 t, between 100 and 500 t, between 500 and 1000 t, and larger than 1000 t.

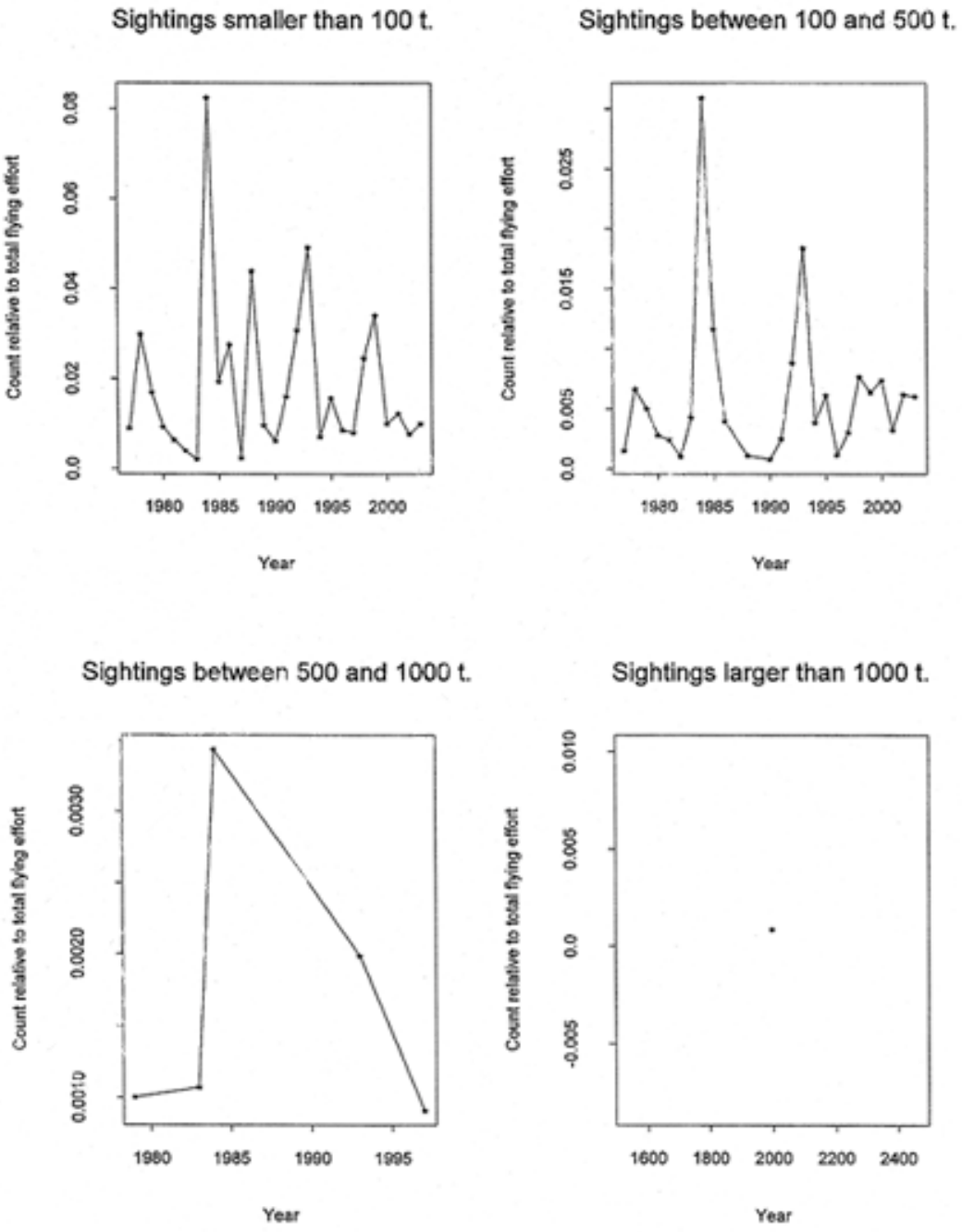

Figure 4b: Annual counts (as a ratio of the total annual flying effort in east Northland) of the number of all sightings of pure (monospecific) schools of kahawai on the east Northland coast within four size classes: smaller than 100 t, between 100 and 500 t, between 500 and 1000 t, and larger than 1000 t.

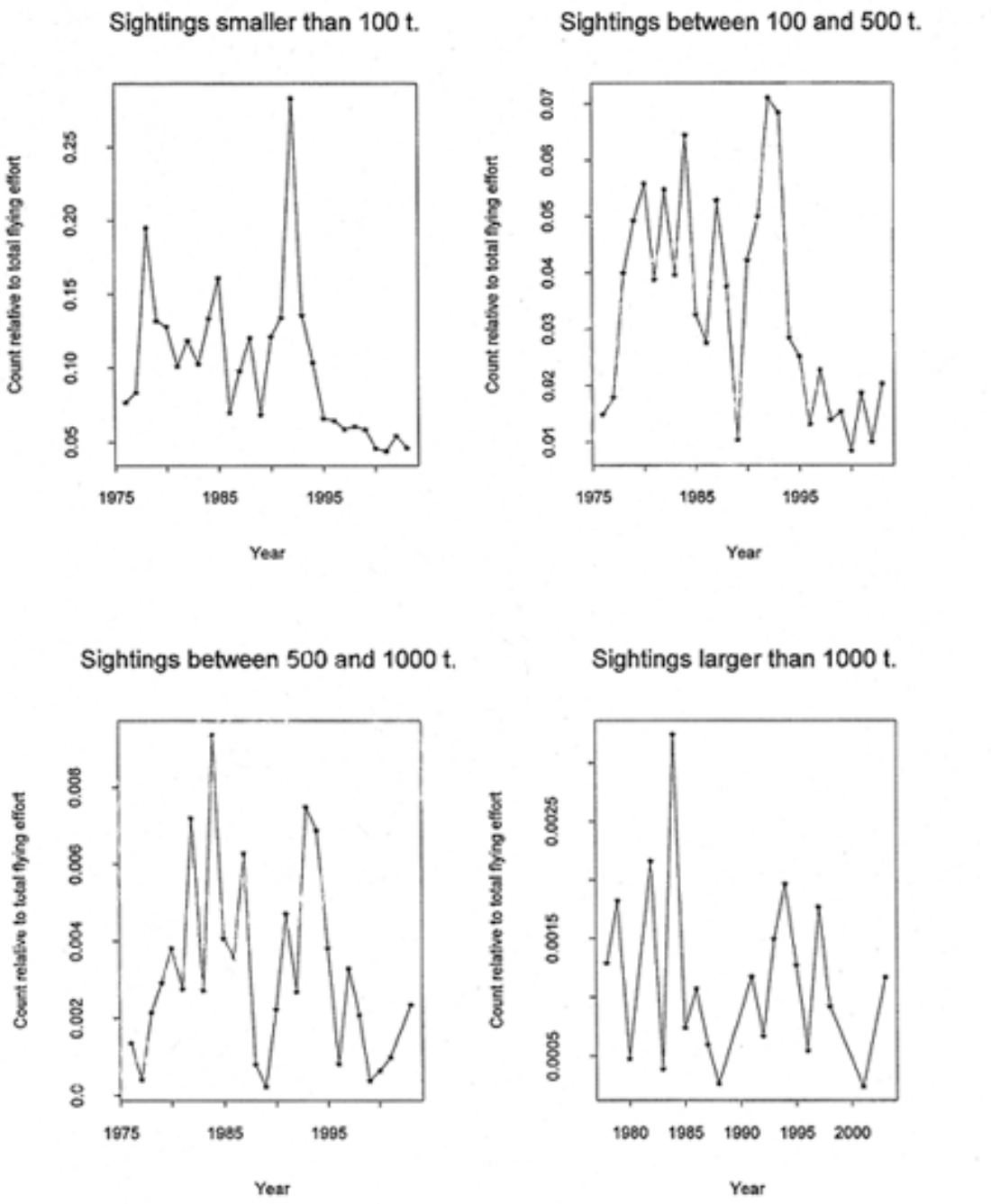

Figure 4c: Annual counts (as a ratio of the total annual flying effort in the Bay of Plenty) of the number of all sightings of pure (monospecific) schools of kahawai in the Bay of Plenty within four size classes: smaller than 100 t, between 100 and 500 t, between 500 and 1000 t, and larger than 1000 t.

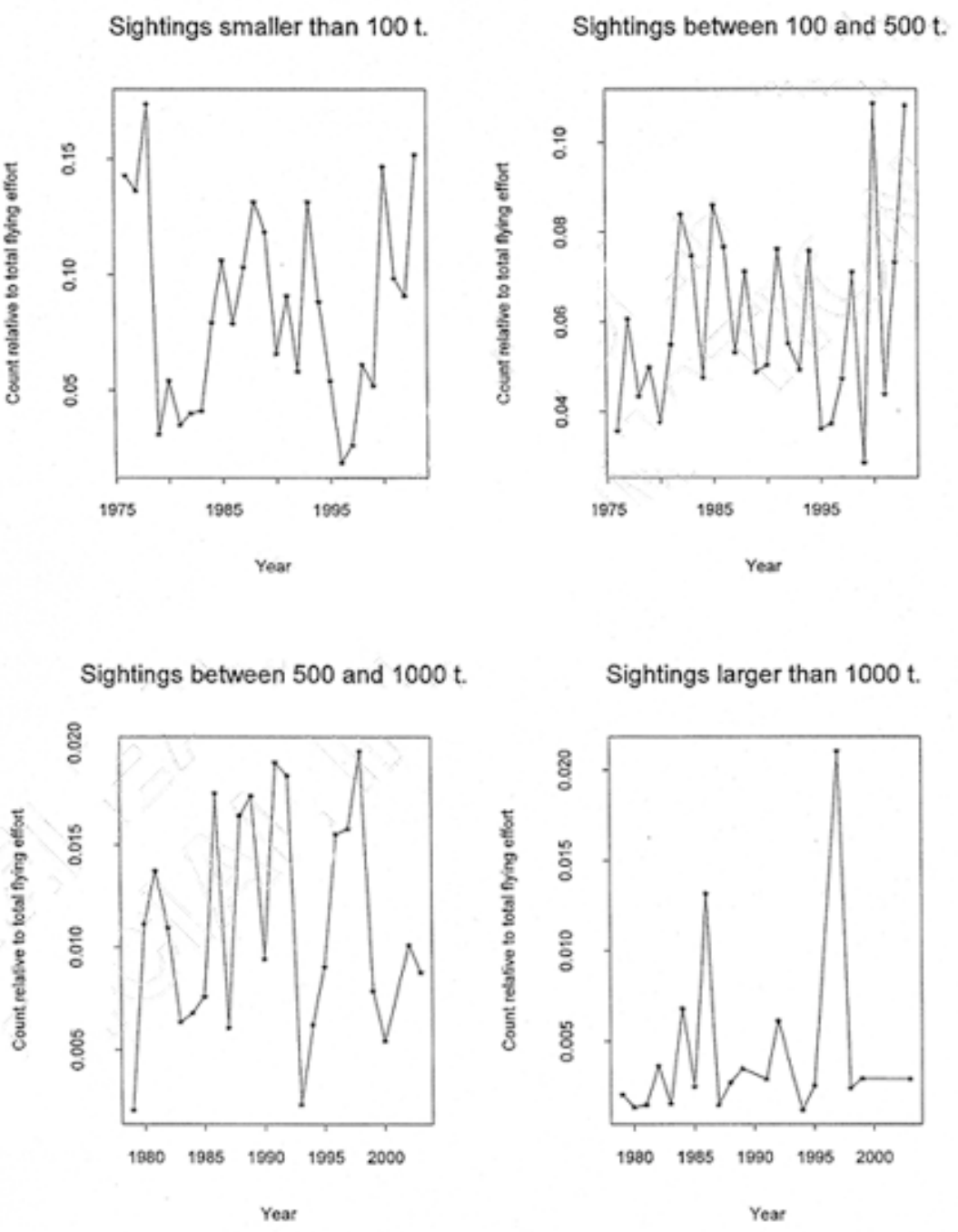

Figure 4d: Annual counts (as a ratio of the total annual flying effort in Hawke Bay) of the number of all sightings of pure (monospecific) schools of kahawai in Hawke Bay within four size classes: smaller than 100 t, between 100 and 500 t, between 500 and 1000 t, and larger than 1000 t.

Appendix A: Number of purse-seine catches of kahawai by statistical area, year, and month — data were available from October 1989 to March 2003 inclusive. Source: MFish catch and effort database.

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	1989	0	0	0	0	0	0	0	0	0	0	0	0
2	1990	0	0	0	0	0	0	0	0	0	0	0	0
2	1991	0	0	0	0	0	0	0	0	0	0	0	0
2	1992	0	0	0	0	0	0	0	0	0	0	1	0
2	1993	0	0	0	0	0	0	0	0	0	3	0	0
2	1994	0	0	0	0	0	0	0	0	0	0	0	0
2	1995	0	0	0	0	0	0	0	0	0	0	0	0
2	1996	0	0	0	0	0	0	0	0	0	0	0	0
2	1997	0	0	0	0	0	0	0	0	0	0	0	0
2	1998	0	0	0	0	0	0	0	0	0	0	0	2
2	1999	0	0	0	0	0	0	0	0	0	0	0	0
2	2000	0	0	0	0	0	0	0	0	0	0	0	0
2	2001	0	0	0	0	0	0	0	0	0	0	1	0
2	2002	0	0	0	0	0	0	0	0	0	0	0	0
2	2003	0	0	0	0	0	0	0	0	0	0	0	0
4	1989	0	0	0	0	0	0	0	0	0	0	0	0
4	1990	0	0	0	0	0	0	0	0	0	0	0	0
4	1991	0	0	0	0	0	0	1	0	0	0	0	0
4	1992	0	0	0	0	0	0	0	0	0	0	0	0
4	1993	0	0	0	0	0	0	0	0	0	0	0	0
4	1994	0	0	0	0	0	0	0	0	0	0	0	0
4	1995	0	0	0	0	0	0	0	0	0	0	0	0
4	1996	0	0	0	0	0	0	0	0	0	0	0	0
4	1997	0	0	0	0	0	0	2	0	0	0	0	0
4	1998	0	0	0	0	0	0	0	0	0	0	0	0
4	1999	0	0	0	0	0	0	0	0	0	0	0	0
4	2000	0	0	0	0	0	0	0	0	0	0	0	0
4	2001	0	0	0	0	0	0	0	0	0	0	0	0
4	2002	0	0	0	0	0	0	0	0	0	0	0	0
4	2003	0	0	0	0	0	0	0	0	0	0	0	0
8	1989	0	0	0	0	0	0	0	0	0	0	0	0
8	1990	0	0	0	0	0	0	0	0	0	0	0	0
8	1991	0	0	0	0	0	0	0	0	0	0	0	0
8	1992	0	0	0	0	0	0	0	0	0	0	1	0
8	1993	0	0	0	0	0	0	0	0	0	0	0	0
8	1994	0	0	0	0	0	0	0	0	0	0	0	0
8	1995	0	0	0	0	0	0	0	0	0	0	0	0
8	1996	0	0	0	0	0	0	0	0	0	0	0	0
8	1997	0	0	0	0	0	0	0	0	0	0	0	0
8	1998	0	0	0	0	0	0	0	0	0	0	0	0
8	1999	0	0	0	0	0	0	0	0	0	0	0	0
8	2000	0	0	0	0	0	0	0	0	0	0	0	0

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
8	2001	0	0	0	0	0	0	0	0	0	0	0	0
8	2002	0	0	0	0	0	0	0	0	0	0	0	0
8	2003	0	0	0	0	0	0	0	0	0	0	0	0
9	1989	0	0	0	0	0	0	0	0	0	6	2	0
9	1990	0	0	0	0	12	42	15	4	22	0	0	0
9	1991	0	0	0	0	27	24	29	17	2	0	0	0
9	1992	0	0	0	17	13	16	17	11	10	0	5	5
9	1993	0	0	0	0	14	30	42	4	0	8	12	0
9	1994	0	0	0	5	10	3	1	0	0	14	0	0
9	1995	0	0	0	0	0	1	39	6	0	3	0	2
9	1996	0	0	0	0	16	10	25	0	0	0	0	0
9	1997	0	0	0	0	0	0	0	48	50	0	0	1
9	1998	0	0	0	0	0	2	4	14	19	0	0	0
9	1999	0	0	0	0	0	0	30	40	5	1	2	0
9	2000	0	0	0	0	1	0	0	47	25	9	2	0
9	2001	0	0	0	0	0	0	3	22	23	0	0	0
9	2002	0	0	0	0	0	12	3	19	20	0	0	0
9	2003	0	0	0	0	0	0	0	0	0	0	0	0
10	1989	0	0	0	0	0	0	0	0	0	0	2	0
10	1990	0	0	0	0	0	0	0	0	2	0	0	0
10	1991	0	0	0	0	0	0	0	0	0	0	0	0
10	1992	0	0	0	0	0	0	0	0	0	0	0	0
10	1993	0	0	0	0	0	1	9	0	0	4	5	0
10	1994	0	0	0	0	0	0	0	0	0	5	0	0
10	1995	0	0	0	0	0	0	0	0	0	0	0	0
10	1996	0	0	0	0	0	0	0	0	0	0	0	0
10	1997	0	0	0	0	0	0	0	0	0	0	0	0
10	1998	0	0	0	0	0	0	0	0	0	0	0	0
10	1999	0	0	0	0	0	0	0	0	0	0	0	0
10	2000	0	0	0	0	0	0	0	0	6	0	0	0
10	2001	0	0	0	0	0	0	0	0	0	0	0	0
10	2002	0	0	0	0	0	0	0	0	0	0	0	0
10	2003	0	0	0	0	0	0	0	0	0	0	0	0
11	1989	0	0	0	0	0	0	0	0	0	0	0	0
11	1990	0	0	0	0	0	0	0	0	0	0	0	0
11	1991	0	0	0	0	0	0	0	0	0	0	0	0
11	1992	0	0	0	0	0	0	0	0	0	0	0	0
11	1993	0	0	0	0	0	0	0	0	0	0	0	0
11	1994	0	0	0	0	0	0	0	0	0	0	0	0
11	1995	0	0	0	0	0	0	0	0	0	0	0	0
11	1996	0	0	0	0	0	0	0	0	0	0	0	0
11	1997	0	0	0	0	0	0	0	0	0	0	0	0
11	1998	0	0	0	0	0	0	0	0	0	0	0	0
11	1999	0	0	0	0	0	0	0	0	0	0	0	0
11	2000	0	0	0	0	0	0	0	0	0	0	0	0
11	2001	7	1	0	0	0	0	0	0	0	0	0	0

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
11	2002	0	0	0	0	0	0	0	0	0	0	0	0
11	2003	0	0	0	0	0	0	0	0	0	0	0	0
12	1989	0	0	0	0	0	0	0	0	0	0	0	0
12	1990	0	0	0	0	0	0	0	0	0	0	0	0
12	1991	0	0	0	0	0	0	0	0	0	0	0	0
12	1992	0	0	0	0	0	0	0	0	0	0	0	0
12	1993	0	0	0	0	0	0	0	0	0	0	0	0
12	1994	0	0	0	0	0	0	0	0	0	0	0	0
12	1995	0	0	0	0	0	0	0	0	0	1	0	0
12	1996	0	0	0	0	0	0	0	0	0	0	0	0
12	1997	0	0	0	0	0	0	0	0	0	0	0	0
12	1998	0	0	0	0	0	0	0	0	0	0	0	0
12	1999	0	0	0	0	0	0	0	0	0	0	0	0
12	2000	0	0	0	0	0	0	0	0	0	0	0	0
12	2001	0	0	0	0	0	0	0	0	0	0	0	0
12	2002	0	0	0	0	0	0	0	0	0	0	0	0
12	2003	0	0	0	0	0	0	0	0	0	0	0	0
13	1989	0	0	0	0	0	0	0	0	0	9	4	0
13	1990	0	0	0	0	0	0	0	0	0	0	0	13
13	1991	0	0	0	0	0	0	0	0	8	0	5	0
13	1992	0	0	0	0	0	0	0	0	0	0	38	0
13	1993	0	0	0	0	0	0	0	0	0	2	0	12
13	1994	0	0	0	0	0	0	0	0	0	10	8	0
13	1995	0	0	0	0	0	0	0	0	0	7	0	0
13	1996	0	0	0	0	0	0	0	0	0	50	0	0
13	1997	0	0	0	0	0	0	0	0	0	0	0	0
13	1998	0	0	0	0	0	0	0	0	0	0	0	0
13	1999	0	0	0	0	0	0	0	0	0	0	0	0
13	2000	0	0	0	0	0	0	0	0	0	0	0	0
13	2001	0	0	0	0	0	0	0	0	0	0	0	0
13	2002	0	0	0	0	0	0	0	0	0	0	6	2
13	2003	0	0	0	0	0	0	0	0	0	0	0	0
14	1989	0	0	0	0	0	0	0	0	0	6	0	0
14	1990	0	0	0	0	27	0	0	0	0	9	0	0
14	1991	0	0	0	0	0	0	0	18	20	24	0	0
14	1992	0	0	0	0	0	0	0	0	0	0	6	0
14	1993	0	0	0	0	0	0	0	0	0	37	10	0
14	1994	4	0	0	0	0	0	0	0	0	22	39	0
14	1995	0	0	0	0	0	0	0	0	0	96	0	0
14	1996	0	0	0	0	0	0	0	0	0	51	0	0
14	1997	0	0	0	0	0	0	0	0	0	9	0	0
14	1998	0	0	0	0	0	0	0	0	8	2	0	0
14	1999	0	0	0	0	0	0	11	19	17	20	7	0
14	2000	0	0	0	0	0	0	0	0	9	11	0	0
14	2001	15	0	0	0	0	0	0	0	0	0	0	0
14	2002	0	0	0	0	0	0	0	0	0	14	19	4

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14	2003	0	0	0	0	0	0	0	0	0	0	0	0
15	1989	0	0	0	0	0	0	0	0	0	0	0	0
15	1990	0	0	0	0	0	0	0	0	0	0	0	0
15	1991	0	0	0	0	0	0	0	2	0	0	0	0
15	1992	0	0	0	0	0	0	0	0	0	0	0	0
15	1993	0	0	0	0	0	0	0	0	0	0	0	0
15	1994	0	0	0	0	8	0	0	0	0	0	0	0
15	1995	0	0	0	0	0	0	0	0	0	0	0	0
15	1996	0	0	0	0	0	0	0	0	0	2	0	0
15	1997	0	0	0	0	0	0	0	0	0	0	0	0
15	1998	0	0	0	0	0	0	0	0	0	0	0	0
15	1999	0	0	0	0	0	0	0	11	0	0	0	0
15	2000	0	0	0	0	0	0	0	0	0	0	0	0
15	2001	0	0	0	0	0	0	0	0	0	0	0	0
15	2002	0	0	2	17	0	0	0	0	0	0	0	0
15	2003	0	0	0	0	0	0	0	0	0	0	0	0
16	1989	0	0	0	0	0	0	0	0	0	0	0	0
16	1990	0	0	0	0	0	0	0	0	0	0	0	0
16	1991	0	0	0	0	0	0	0	0	0	0	0	0
16	1992	0	0	0	0	0	0	0	0	0	0	0	0
16	1993	0	0	0	0	0	0	0	0	0	0	0	0
16	1994	0	0	0	0	0	0	0	0	0	0	2	0
16	1995	0	0	0	0	0	0	0	0	0	0	0	0
16	1996	0	0	0	0	0	0	0	0	0	0	0	0
16	1997	0	0	0	0	0	0	0	0	0	0	0	0
16	1998	0	0	0	0	0	0	0	0	0	0	0	0
16	1999	0	0	0	0	0	0	0	0	0	0	0	0
16	2000	0	0	0	0	0	0	0	0	0	0	0	0
16	2001	0	0	0	0	0	0	0	0	0	0	0	0
16	2002	0	0	0	0	0	0	0	0	0	0	0	0
16	2003	0	0	0	0	0	0	0	0	0	0	0	0
17	1989	0	0	0	0	0	0	0	0	0	0	8	0
17	1990	0	7	5	16	12	0	0	0	0	5	16	4
17	1991	2	6	3	2	0	0	0	0	0	0	4	1
17	1992	0	0	0	0	4	0	0	0	0	0	0	0
17	1993	0	0	0	0	4	0	3	0	0	0	0	0
17	1994	0	0	0	6	3	0	0	0	0	0	0	0
17	1995	0	0	0	0	8	0	0	0	0	0	17	0
17	1996	0	0	0	0	0	0	0	0	0	0	2	0
17	1997	0	0	0	0	0	0	0	0	0	0	0	0
17	1998	0	0	0	3	0	0	0	0	0	0	0	0
17	1999	0	0	0	2	0	0	0	0	0	0	0	0
17	2000	4	0	0	4	0	0	0	0	0	0	0	1
17	2001	0	0	0	0	5	0	0	0	0	0	0	0
17	2002	0	0	0	0	0	0	0	0	4	0	0	0
17	2003	0	0	0	0	0	0	0	0	0	0	0	0

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
18	1989	0	0	0	0	0	0	0	0	0	6	26	11
18	1990	0	14	0	22	20	4	0	0	0	13	18	3
18	1991	18	10	4	7	0	0	0	0	0	8	16	10
18	1992	16	4	0	0	0	0	0	0	0	8	6	0
18	1993	0	0	0	4	12	0	0	0	0	14	10	0
18	1994	0	0	0	14	4	0	0	0	0	9	7	0
18	1995	0	0	0	0	0	0	0	0	0	0	3	0
18	1996	0	0	0	8	10	0	0	0	0	0	0	0
18	1997	0	0	0	6	3	0	0	0	0	0	0	0
18	1998	0	0	0	0	6	1	0	0	0	0	0	0
18	1999	0	0	0	3	8	4	0	0	0	4	0	2
18	2000	0	0	0	0	0	0	0	0	0	0	7	3
18	2001	0	0	0	0	0	2	0	0	0	0	0	0
18	2002	0	0	0	0	1	0	0	0	0	0	0	0
18	2003	0	0	0	0	0	0	0	0	0	0	0	0
19	1989	0	0	0	0	0	0	0	0	0	0	0	0
19	1990	0	0	0	0	3	0	0	0	0	0	0	0
19	1991	0	0	0	0	0	0	0	0	0	0	0	0
19	1992	0	0	0	0	0	0	0	0	0	0	0	0
19	1993	0	0	0	0	0	0	0	0	0	0	0	0
19	1994	0	0	0	0	0	0	0	0	0	0	0	0
19	1995	0	0	0	0	0	0	0	0	0	0	0	0
19	1996	0	0	0	0	0	0	0	0	0	0	0	0
19	1997	0	0	0	0	0	0	0	0	0	0	0	0
19	1998	0	0	0	0	0	0	0	0	0	0	0	0
19	1999	0	0	0	0	0	0	0	0	0	0	0	0
19	2000	0	0	0	0	0	0	0	0	0	0	0	0
19	2001	0	0	0	0	0	0	0	0	0	0	0	0
19	2002	0	0	0	0	0	0	0	0	0	0	0	0
19	2003	0	0	0	0	0	0	0	0	0	0	0	0
36	1989	0	0	0	0	0	0	0	0	0	0	0	0
36	1990	0	2	0	0	0	12	3	5	0	0	0	0
36	1991	0	0	0	0	0	0	0	0	0	0	0	0
36	1992	0	5	0	4	0	0	0	0	0	0	0	3
36	1993	0	1	0	0	0	0	0	0	0	0	0	0
36	1994	0	8	0	0	0	0	0	0	0	0	2	10
36	1995	8	0	0	0	0	0	0	0	0	2	0	0
36	1996	4	0	0	0	0	0	0	0	0	0	4	0
36	1997	0	0	0	0	0	0	0	0	2	0	0	0
36	1998	0	0	0	0	0	0	0	0	0	0	0	0
36	1999	0	0	0	0	0	0	0	0	0	0	0	0
36	2000	0	0	0	0	0	0	0	0	0	0	0	0
36	2001	0	0	0	0	0	0	0	0	0	0	0	0
36	2002	0	0	0	0	0	0	0	0	0	0	0	0
36	2003	0	4	0	0	0	0	0	0	0	0	0	0
37	1989	0	0	0	0	0	0	0	0	0	2	0	0

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
37	1990	0	0	0	0	2	1	0	5	5	11	0	0
37	1991	0	0	0	0	0	0	0	0	0	0	2	0
37	1992	0	0	0	0	0	0	0	0	0	0	0	12
37	1993	0	3	0	0	0	0	0	0	0	0	18	2
37	1994	0	0	0	0	0	0	0	0	0	1	1	1
37	1995	8	0	0	0	0	0	0	0	0	5	13	7
37	1996	12	0	0	0	0	0	0	0	0	8	5	0
37	1997	2	0	0	0	0	0	0	0	0	0	0	0
37	1998	0	0	0	0	0	0	0	0	0	0	0	0
37	1999	0	0	0	2	0	0	0	0	2	0	0	0
37	2000	0	0	0	0	0	0	0	0	0	0	0	1
37	2001	0	0	0	0	0	0	0	0	0	0	0	0
37	2002	0	0	0	0	0	0	0	0	0	0	0	0
37	2003	0	0	1	0	0	0	0	0	0	0	0	0
38	1989	0	0	0	0	0	0	0	0	0	4	2	6
38	1990	21	4	0	0	2	0	0	0	0	6	0	3
38	1991	6	1	1	0	0	0	0	0	0	0	1	1
38	1992	0	1	0	0	0	0	0	0	0	0	0	1
38	1993	0	0	0	0	5	0	0	0	0	0	0	0
38	1994	0	0	0	0	0	5	0	0	0	0	0	1
38	1995	0	0	0	0	0	0	0	0	0	3	1	1
38	1996	1	0	0	0	0	0	0	0	0	0	0	0
38	1997	0	0	0	0	0	0	0	0	0	2	0	0
38	1998	0	0	0	0	0	0	0	0	0	0	0	0
38	1999	0	0	0	0	0	0	0	0	0	0	0	0
38	2000	0	0	0	0	0	0	0	0	0	0	0	2
38	2001	0	0	0	0	0	0	0	0	0	0	0	0
38	2002	0	0	0	0	0	0	0	0	3	0	0	0
38	2003	0	0	0	0	0	0	0	0	0	0	0	0
39	1989	0	0	0	0	0	0	0	0	0	0	0	0
39	1990	0	0	0	0	0	0	0	0	0	0	0	0
39	1991	0	0	0	0	0	0	0	0	0	0	0	0
39	1992	0	0	0	0	0	0	0	0	0	0	0	0
39	1993	0	0	0	0	0	0	0	0	0	0	0	0
39	1994	0	0	0	0	0	0	0	0	0	0	0	0
39	1995	0	0	0	0	0	0	0	0	0	0	0	0
39	1996	0	0	0	0	0	0	0	0	0	0	0	0
39	1997	0	0	0	0	0	0	0	0	0	0	0	0
39	1998	0	0	0	0	0	0	0	0	1	0	0	0
39	1999	0	0	0	0	0	0	0	0	0	0	0	0
39	2000	0	0	0	0	0	0	0	0	0	0	0	0
39	2001	0	0	0	0	0	0	0	0	0	0	0	0
39	2002	0	0	0	0	0	0	0	0	0	0	0	0
39	2003	0	0	0	0	0	0	0	0	0	0	0	0
40	1989	0	0	0	0	0	0	0	0	0	0	0	0
40	1990	2	0	0	0	0	0	0	0	11	7	0	0

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	1991	0	0	0	0	0	0	0	0	0	0	0	0
40	1992	0	0	0	0	0	0	0	0	0	0	0	0
40	1993	0	3	0	0	0	0	0	0	0	0	0	0
40	1994	0	0	0	0	0	0	0	0	0	0	0	24
40	1995	0	0	0	0	0	0	0	0	0	0	10	0
40	1996	0	0	0	0	0	0	0	0	0	0	0	0
40	1997	7	0	0	0	0	0	0	0	0	0	0	0
40	1998	0	0	0	0	0	0	0	0	0	0	0	0
40	1999	0	0	0	0	0	0	0	0	0	0	0	0
40	2000	0	0	0	0	0	5	0	0	0	0	0	0
40	2001	0	0	0	0	0	0	0	0	0	0	0	0
40	2002	0	0	0	0	0	3	0	0	0	0	0	0
40	2003	0	0	0	0	0	0	0	0	0	0	0	0
46	1989	0	0	0	0	0	0	0	0	0	0	0	0
46	1990	0	0	0	0	0	0	0	0	0	0	0	0
46	1991	0	0	0	0	0	0	0	0	0	0	0	0
46	1992	0	0	0	0	0	0	0	0	0	0	0	0
46	1993	0	0	5	0	0	0	0	0	0	0	0	0
46	1994	0	0	0	0	0	0	0	0	0	0	0	0
46	1995	0	0	0	0	0	0	0	0	0	0	0	0
46	1996	0	0	0	0	0	0	0	0	0	0	0	0
46	1997	0	0	0	0	0	0	0	0	0	0	0	0
46	1998	0	0	0	0	0	0	0	0	0	0	0	0
46	1999	0	0	0	0	0	0	0	0	0	0	0	0
46	2000	0	0	0	0	0	0	0	0	0	0	0	0
46	2001	0	0	0	0	0	0	0	0	0	0	0	0
46	2002	0	0	0	0	0	0	0	0	0	0	0	0
46	2003	0	0	0	0	0	0	0	0	0	0	0	0
47	1989	0	0	0	0	0	0	0	0	0	0	0	0
47	1990	0	0	0	0	0	0	0	0	0	0	0	0
47	1991	0	0	0	0	0	0	0	0	0	0	0	0
47	1992	0	0	0	0	0	0	0	0	0	0	0	0
47	1993	0	1	2	0	0	0	0	0	0	0	0	0
47	1994	0	0	0	0	0	0	0	0	0	0	0	0
47	1995	0	0	0	0	0	0	0	0	0	0	0	0
47	1996	0	0	0	0	0	0	0	0	0	0	0	0
47	1997	0	0	0	0	0	0	0	0	0	0	0	0
47	1998	0	0	0	0	0	0	0	0	0	0	0	0
47	1999	0	0	0	0	0	0	0	0	0	0	0	0
47	2000	0	0	0	0	0	0	0	0	0	0	0	0
47	2001	0	0	0	0	0	0	0	0	0	0	0	0
47	2002	0	0	0	0	0	0	0	0	0	0	0	0
47	2003	0	0	0	0	0	0	0	0	0	0	0	0
101	1989	0	0	0	0	0	0	0	0	0	0	0	0
101	1990	0	0	0	0	0	0	0	0	0	0	0	0
101	1991	0	0	0	0	0	0	0	0	0	0	0	0

Stat. Area	Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
101	1992	0	0	0	0	0	0	0	0	0	0	0	0
101	1993	0	0	0	0	0	0	0	0	0	0	0	0
101	1994	0	0	0	0	0	0	0	0	0	0	0	0
101	1995	0	0	0	0	0	0	0	0	0	0	0	0
101	1996	0	0	0	0	0	0	0	0	0	0	0	0
101	1997	0	0	0	0	0	0	0	0	0	0	0	0
101	1998	0	0	0	0	0	0	0	0	0	0	0	0
101	1999	0	0	0	0	0	0	1	0	0	0	0	0
101	2000	0	0	0	0	0	0	0	0	0	0	0	0
101	2001	0	0	0	0	0	0	0	0	0	0	0	0
101	2002	0	0	0	0	0	0	0	0	0	0	0	0
101	2003	0	0	0	0	0	0	0	0	0	0	0	0
106	1989	0	0	0	0	0	0	0	0	0	0	0	0
106	1990	0	0	0	0	0	0	0	0	0	0	0	0
106	1991	0	0	0	0	0	0	0	0	0	0	0	0
106	1992	0	0	0	0	0	0	0	0	0	0	0	0
106	1993	0	0	0	0	0	0	0	0	0	0	0	0
106	1994	0	0	0	0	0	0	0	0	0	0	0	0
106	1995	0	0	0	0	0	0	0	1	0	0	0	0
106	1996	0	0	0	0	0	0	0	0	0	0	0	0
106	1997	0	0	0	0	0	0	0	1	0	0	0	0
106	1998	0	0	0	0	0	0	0	0	0	0	0	0
106	1999	0	0	0	0	0	0	0	0	0	0	0	0
106	2000	0	0	0	0	0	0	0	0	0	0	0	0
106	2001	0	0	0	0	0	0	0	0	0	0	0	0
106	2002	0	0	0	0	0	0	0	0	0	0	0	0
106	2003	0	0	0	0	0	0	0	0	0	0	0	0
206	1989	0	0	0	0	0	0	0	0	0	0	0	0
206	1990	3	0	0	0	0	0	0	0	0	0	0	0
206	1991	0	0	0	0	0	0	0	0	0	0	0	0
206	1992	0	0	0	0	0	0	0	0	0	0	0	0
206	1993	0	0	0	0	0	0	0	0	0	0	0	0
206	1994	0	0	0	0	0	0	0	0	0	0	0	0
206	1995	0	0	0	0	0	0	0	0	0	0	0	0
206	1996	0	0	0	0	0	0	0	0	0	0	0	0
206	1997	0	0	0	0	0	0	0	0	0	0	0	0
206	1998	0	0	0	0	0	0	0	0	0	0	0	0
206	1999	0	0	0	0	0	0	0	0	0	0	0	0
206	2000	0	0	0	0	0	0	0	0	0	0	0	0
206	2001	0	0	0	0	0	0	0	0	0	0	0	0
206	2002	0	0	0	0	0	0	0	0	0	0	0	0
206	2003	0	0	0	0	0	0	0	0	0	0	0	0