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October 1, 2008

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300 Ala Moana Blvd
Honolulu, Hawaii 96850

Status Review of Black-footed Albatross

Dear Mr. Leonard:

I am responding to the request for information concerning the black-footed albatross (BFAL) in 72 Fed. Reg. 57278-83 (October 9, 2007). I am including analyses of BFAL albatross census data that were not available during the official comment period. For the most part I will focus on two issues for which USFWS found that the petition to list presents substantial scientific information indicating that listing may be warranted: (1) inadequacy and ineffectiveness of existing regulations to minimize the mortality and injury of BFAL in longline fisheries; and (2) the ingestion of environmental contaminants. 73 Fed. Reg. at 57278, col. 2.

I am qualified as an expert in the biology and conservation of BFAL. I was the seabird biologist for the USFWS Hawaiian Islands National Wildlife Refuge (1978-1982), authored **Seabirds of Hawaii: Natural History and Conservation** (Cornell University Press, 1990), was a founding board member and officer of the American Bird Conservancy (1994-2002) which has focused on seabird conservation, and have served as the Vice-chair for Conservation of the Pacific Seabird Group (1992 to present). The views expressed here are entirely my own. I acknowledge the assistance of Lowell Smith in preparing many of the analyses presented in the figures. Mr. Smith is a genuine "rocket scientist" who helped bring Apollo 13 safely back to earth,

I. IUCN "Endangered" Status

The Federal Register notice mentions the IUCN/Birdlife International status of BFAL in several places (e.g., "the IUCN reclassification of the black-footed albatross from Vulnerable to Endangered in 2003," 72 Fed. Reg. at 57281, col. 1). Differing definitions of "endangered" by various entities is very confusing and unfortunate. Whenever USFWS mentions a finding by IUCN/Birdlife International that the BFAL is "endangered," the Service should clarify that the IUCN/Birdlife International's definition is of "endangered" is closer to the concept of "species of special concern" than "endangered" under the Endangered Species Act (ESA). *See* criteria at http://www.iucnredlist.org/info/categories_criteria2001. The IUCN/Birdlife International listed BFAL based on criterion A3, whereby it projects or suspects a BFAL population size reduction of 50% within the next three generations, which can be as long as 100 years. (Dr. Stuart Butchart, BirdLife International, pers. comm.). Thus IUCN/Birdlife International does not employ "endangered" to mean endangered under the ESA ("in danger of extinction") or even threatened under the ESA ("may become endangered within the foreseeable future.") Under the IUCN/Birdlife International criteria a plausible population model of *Homo sapiens* could conclude that the escalation in the price of energy will sufficiently undermine current methods of producing and distributing food so that during the next 100 years the human population will decline by 50% from 6.6 billion to 3.3 billion. *See*, e.g., http://dieoff.org/. Under the IUCN/BirdLife criteria, *Homo sapiens* would be "endangered" today.

II. Curtailment of Historic Range

While USFWS did not find the petition to present substantial information concerning the contention that the range of the BFAL is continuing to contract, I want to make a few points on this issue. The petition mentions former colonies at Johnston Atoll, Wake Island, Taongi Atoll (Marshall Islands), Marcus Island (Minami Torishima), Iwo Jima and the Northern Mariana Islands. 72 Fed. Reg. at 57280, col. 2. Like so many early reports of wildlife most anywhere, much of our information about these colonies is skimpy and anecdotal. With the exception of Marcus Island, these colonies were probably fairly small.[1] Marcus Island is sometimes said to have had a population of one million Laysan and black-footed albatrosses,[2] but I can find no critical analysis of such estimates. Marcus Island encompasses about 1.2 km^2 of land mass, and is smaller than the land mass at Midway Atoll (6.2 km^2), Laysan Island (4.1 km^2) or Lisianksi Island (1.55 km^2). The sand spits that comprise the land mass at Pearl and Hermes Reef (0.36 km^2) seem to have the most concentrated nesting habitat for BFAL anywhere during recent decades. In 2003, Pearl and Hermes Reef had 6,116 BFAL nests[3] which represents a density of about 17,000 nests per km^2. Assuming that Marcus Island has nesting habitat for BFAL as good as Pearl and Hermes Reef (unlikely because Marcus is not a series of sand spits which seems to be the most favorable nesting habitat for BFAL), applying a density of 17,000 per km^2 to the 1.2 km^2 at Marcus Island leads to an estimate of 20,386 BFAL nests. Twenty thousand BFAL is two percent of one million BFAL. Marcus Island was surely once an important BFAL colony, but probably had no more BFAL nests than Laysan or Midway have today. Restoring this island to its past productivity would be a worthy goal if politically and technically feasible. But those who study the natural history of BFAL should not cite a population of one million albatrosses at Marcus Island without analyzing whether such estimates are even remotely plausible.

III. Recent Nest Count Trends (1992 to present)

If either fishery bycatch or contaminants posed a genuine threat to the long-term survival of BFAL we would see disturbing nesting trends at their colonies. For several years I have been both fascinated and appalled by a transparent attempt by some modelers to torture BFAL data to

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[1] D. W. Rice and K. W. Kenyon. 1962. Breeding distribution, history and populations of North Pacific albatrosses. Auk 79: 365-386.

[2] Rice and Kenyon, p. 380. These estimates may have even included short-tailed albatrosses as well -- a reflection of how little we understand the basis for them.

[3] Naughton, M., K. Morgan. K. S. Rivera 2008. Species Information---Black-footed Albatross (Phoebastria nigripes). Unpublished report for ACAP, Table 3.

make it confess to a declining population in the face of stable or increasing nest counts. Below I present some standard off-the-shelf analyses of the nest counts of BFAL since 1992 when USFWS instituted a monitoring program. I used the raw FWS data that is contained in Flint (2007),[4] supplemented with the counts and estimates for 2008 (Maura Naughton, USFWS, pers. comm.). I analyze the trends for each of the three breeding locations where the nests are counted or estimated on an annual basis: Midway Atoll, Laysan Island and French Frigate Shoals (Table 1). In a more perfect world, we would also have nest trends for Pearl and Hermes Reef, which

Table 1. Black Footed Albatross Nests, 1992 to 2008.

Year	Pooled FFS, Midway and Estimated Laysan	Pooled FFS, Midway and Counted Laysan	FFS Counted	Laysan Counted	Laysan Estimated	Midway Counted
1992	48474		3608		25109	19757
1993	53369		3817		29558	19994
1994	NA		3816		32414	NA
1995	44816		3280		22805	18731
1996	46828		2760		24813	19255
1997	51689		3321		26723	21645
1998	48973	46768	3964	22314	24519	20490
1999	52146	47971	4164	23297	27472	20510
2000	46045	41090	3573	19900	24855	17617
2001	41911	43781	3899	21389	19519	18493
2002	46143	44618	3869	21737	23262	19012
2003	59555	42179	3328	19520	36896	19331
2004	45457	43831	3966	19472	21098	20393
2005	57176	47094	4259	21006	31088	21829
2006	NA	NA	NA	19456	27816	24085
2007	63100	52086	5725	21456	32488	24887
2008	NA	NA	NA	19672	21751	25320

[4] Flint, E. 2007. Hawaiian Islands National Wildlife Refuge and Midway Atoll National Wildlife Refuge Counts Through Hatch Year 2007. USFWS report. I corrected the error in Table 5 which reports the sum of all nests for Hatch Year 1993 as 33,691 instead of 53,369.

has more BFAL than French Frigate Shoals. Pearl and Hermes Reef is presumably ignored because of logistical problems associated with its remote and uninhabited location. I also present aggregate trends for all locations where the nests are counted or estimated annually (Table 1).

Midway Atoll counts show an obvious upward trend from 1992 to 2008 with a reasonable fit using a linear correlation (R^2 = 0.39) and an excellent fit for a polynomial correlation (R^2 = 0.80) although there was a small dip around the year 2000 (Figures 1-2). Later I discuss the likely biological reasons and implications for occasional short-term nest count dips in albatrosses. The general upward trend with a dip around year 2000 at Midway Atoll is even more evident if you focus on the most recent decade, 1998 to 2008 (linear correlation R^2 = 0.63; polynomial correlation R^2 = 0.95) (Figures 3-4).

Similarly at French Frigate Shoals, the nest counts evidence a clear upward trend from 1992 to 2007 (counts for the entire atoll were not possible in 2006 and 2008) with reasonably good if not excellent fits using either a linear (R^2 = 0.34) or polynomial correlation (R^2 = 0.65). The dip around the year 2000 seemed to have begun slightly earlier at French Frigate Shoals than at Midway Atoll and was less exaggerated (Figures 5-6). The upward trend and dip around year 2000 at French Frigate Shoals remains about the same if you focus on the most recent decade, 1998 to 2007 (linear correlation R^2 = 0.34; polynomial correlation R^2 = 0.91) (Figures 7-8).

The trends since 1992 at Laysan Island are different from Midway and French Frigate Shoals and are somewhat confounded by a change in the methodology of censusing BFAL. Beginning in 1992 and continuing to the present, USFWS has employed a quadrat technique to estimate the numbers of BFAL nests. In 1998, a direct count method was added and USFWS biologists began counting every active nest site. For most censuses, the direct count method has resulted in fewer nests, often significantly fewer. USFWS believes that the direct count method provides a more accurate estimate of BFAL nests. The plot of estimated BFAL nests from 1992 to 2008 shows scattered data with no discernable trend using a linear correlation (R^2 = 0.001) (Figure 9) and peaks in 1994 and 2005 together with troughs around 2000 and 2008 using a polynomial correlation (R^2 = 0.208; Figure 10). The trends using the estimated nest methodology do not change much if you focus on the most recent decade, 1998 to 2008 (linear correlation R^2 = 0.041; polynomial correlation R^2 = 0.202) (Figures 11-12). Confining the analysis to the direct count censuses, the counts evidence a negative trend from 1998 to 2008 using a linear correlation (R^2 = 0.323) and a decline followed by a straight line trend after 2002 using a polynomial correlation (R^2 = 0.426) (Figures 13-14). It should be noted that these two methodologies should never be combined (it would be an apples and oranges analysis), which unfortunately has been done with some previous USFWS and other analyses in the past. **The Endangered Species Office should ascertain whether this mistake has been made in any analyses (included publications) that the Service is evaluating because those analysis violate fundamental scientific principles and should be discarded**.

The trend of the BFAL nests as a whole, of course, is the most important trend for the conservation of the species. While there is a small dip around 2000-2002, the composite trend is generally positive from 1992 to 2007 with a somewhat weak fit using a linear correlation (R^2 = 0.167) and a fairly good fit for a polynomial correlation (R^2 = 0.476) (Figures 15-16). The upward trend and dip around years 2000-2002 for all colonies is even more evident if you focus on the most recent decade, 1998 to 2007 (linear correlation $R^2 = 0.342$; polynomial correlation $R^2 = 0.536$) (Figures 17-18). Because no counts were undertaken at French Frigate Shoals in two of the three most recent years (2006 and 2008), analyzing the composite data for three islands suffers from losing two of the three most recent years. To correct for this problem, I also plotted two-island composite data (Midway Atoll and Laysan only, ignoring the much smaller colony at French Frigate Shoals) from 1998 to 2008. These plots also show an upward trend (linear correlation $R^2 = 0.247$; polynomial correlation $R^2 = 0.256$) (Figures 19-20).

Discussion of Recent Trends in Nest Counts.

All of the nest trend analyses (Table 1; Figures 1-20) assume that the number of BFAL nests each year is a good indicator of the BFAL population. However, the lowest counts do not necessarily reflect a sudden population decline when the nest counts subsequently rebound.

The trends of the nest counts since 1992 are positive when the major nesting sites are pooled (Figures 15-20). The mean number of nests for Midway, Laysan and FFS from 1992 to 2008 (excluding the years where estimates or counts were not available at all locations) is 50,406. The highest count (2007) was about 25% above the mean and the lowest (2001) was about 17% below the mean. From a historical perspective, these variations are fairly minor. Harvey I. Fisher studied albatross on Midway Atoll and elsewhere for 30 years and probably ranks even today as the most prominent albatross biologist in the North Pacific. Fisher conducted a 13-year study of banded Laysan albatrosses (LAAL) on Midway from 1961 to 1973. Among the many phenomena that he observed was the occurrence of “good and “bad” breeding seasons for albatrosses, as reflected in the number of albatrosses that attempted to breed. He noted

> we observed major annual fluctuations in the breeding populations in two study areas in 1964 and 1968, for example, they dropped as much as 50 percent, and then rebounded to even greater numbers.[5]

Given the huge fluctuations that Fisher observed in LAAL, the index of the BFAL population is remarkably stable. In writing about albatross biology in 1990, I made the same general point.

> The marine environment can be fickle, and albatrosses have occasional bad years for reasons that biologists do not fully understand. Studies by Harvey Fisher on Midway indicate that 1964-65 and 1968-69 were very poor years for Laysans, and only about half the normal number nested. Severe storms in December 1964 contributed to a massive early desertion of eggs. Interestingly, storms associated with El Niño caused similar problems in the Galapagos just six months later. Adult mortality

[5] Fisher, H. I. 1975. Mortality and survival in Laysan Albatross, *Diomedea immutabilis*. Pacific Science 29: 279-300 (see p. 283).

> was not abnormal at either Midway or the Galapagos, and the birds returned in succeeding years. Apparently the conditions for foraging were poor and many adults sensibly choose to rest that year. Severe die-offs of fledglings on Pearl and Hermes Reef in 1933, 1963, and 1978 may have been related to the availability of food. Biologists rarely visit Pearl and Hermes, and such extraordinary mortality may occur much more often than we know. The boom and bust years of albatrosses may indicate the general productivity of the marine environment.[6]

Midway, Laysan and FFS each seemed to have had a decline in breeding BFAL around the years 2000-2002 (Figures 1-14). While massive by-catch mortality would presumably cause nesting BFAL to decline, a more likely explanation is that general oceanographic and feeding conditions were relatively poor during those years and the albatrosses chose not to breed. This phenomenon is similar to the response of LAAL to poor oceanographic conditions in 1964-65 and 1968-69. If the short-term declines reflected fishery mortality, it seems unlikely that the number of nests would have rebounded so quickly in subsequent years. A compatible interpretation of the data is that the BFAL were responding to two alternate states of the Pacific Decadal Oscillation, only one of which is good for breeding (Dr. David Duffy, University of Hawaii, pers. comm.) These data and breeding considerations imply that when assessing populations of albatrosses, what may be most important is not the occasional "low" number of nests but rather the "high" numbers which may better reflect the population of breeding adults. <u>If it is not already doing so, USFWS should design studies on Midway and Laysan to replicate Harvey Fisher's approach so that we can know whether a population that rebounds after a "bad" year reflects established breeders returning to the colony or new albatrosses breeding for the first time.</u>

There seem to have been some slight population declines on Laysan Island during the past 16 years. The nest trends of BFAL are an index of population health, and must be interpreted in light of albatross biology. While mortality such as fishery by-catch can lead to declines, periodic lower counts and estimates can be nesting adults merely taking a one- or two-year vacation from breeding. For example, the decline in counted nests on Laysan Island from 1999 (23,297) to 2000 (19,900) is highly unlikely to be due to mortality from fishery by-catch because in 2001 (21,389) and 2002 (21,737) most of the birds returned to breed (Table 1). Similarly, the relatively low counts at Laysan Island in 2003 (19,520), 2004 (19,472) and 2006 (19,456) are unlikely to reflect massive sudden morality because the numbers rebounded in 2005 (21,006) and 2007 (21,456) (Table 1). For the 11 years from 1998 to 2008, the mean count was 20,838 nests, the highest count (1999) was 12% above the mean and the lowest (2004) was 6.5% below the mean. These data suggest that the BFAL population at Laysan is fairly stable population while Midway is increasing at a healthy rate (Figures 1-4).

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[6] Harrison, C. S. 1990. Seabirds of Hawaii: Natural History and Conservation (Cornell University Press), p. 112.

If there are declines at Laysan, what is happening there? This question implicates the age-old issue of whether nesting habitat or food resources limits the size of the BFAL population. Unless the Laysan Island and Midway birds feed in very different areas (satellite tracking data might resolve this question), the differences in nest count trends are caused by phenomena at the colony, not at sea. It is plausible that the Midway population is continuing to recover from the hazing, egg removal, airplane strikes, intentional mortality and general effects of up to 15,000 residents that World War II and the U.S. Navy residents inflicted on these birds until at least the 1960s.[7] During that era it seems likely that many displaced BFAL breeders and prospective breeders moved to Laysan Island where there was no human disturbance. In the absence of continued disturbance at Midway Atoll, it is no surprise that over time more BFAL breed there instead of Laysan Island. USFWS should undertake studies to test are the following hypotheses:

- whether BFAL today find the breeding habitat to be better at Midway Atoll than on Laysan Island, and are choosing their breeding sites accordingly;

- whether the presence of field camps at Laysan Island or the removal of exotic vegetation (potentially increasing blowing sand, a cause of mortality at Laysan Island when alien rabbits consumed most vegetation) is interfering with BFAL reproduction; and

- whether LAAL are out-competing BFAL for nest sites on Laysan Island.

IV. Population Trends Before 1992

In 1990, relying on nesting information from around 1978-1982, I wrote that the "world breeding population of black-foots is about 50,000 pairs, with the majority nesting on Laysan, Pearl and Hermes Reef and Midway."[8] With respect to specific colonies, I estimated that the number of pairs were the following: French Frigate Shoals (4,000-4,500), Laysan Island (14,000-21,000) and Midway Atoll (6,500-7,500).[9] My USFWS colleagues and I had previously published these estimates elsewhere.[10] My team of USFWS biologists noted in 1984 that BFAL

> has generally recovered in the NWHI from the depredations of feather hunting at the turn of the century on Laysan, Lisianski and

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[7] *See*, e.g., Rice and Kenyon, p. 371, Figure 2.

[8] Harrison, C. S. 1990. Seabirds of Hawaii: Natural History and Conservation (Cornell University Press), p. 110.

[9] Harrison, Seabirds of Hawaii, Table 1, pp. 56-57.

[10] Harrison, C. S., M. B. Naughton and S. I. Fefer. 1984. The Status and Conservation of Seabirds in the Hawaiian Archipelago and Johnston Atoll, pp. 513-526 in J. P. Croxall, P. G. H. Evans and R. W. Schreiber, Status and Conservation of the World's Seabirds, International Council for Bird Preservation, Technical Publication No. 2.

> probably other islands . . . . The introduction of Rabbits (*Oryctolagus cuniculus*) to Laysan and Lisianski during the early part of the twentieth century probably contributed to the decline in albatross populations by influencing nesting success. The lack of vegetation probably resulted in increased storm-related mortality due to blowing sand. Introduced vegetation and soil on Sand Island, Midway, early in the twentieth century stabilized the substrate and increased the island's area which resulted in local population increases there. Populations may be increasing on Midway but overall they are probably fairly stable in the NWHI.[11]

Two decades later, it is difficult not to be optimistic about the status of BFAL. Both the Midway and Laysan populations are larger, and the overall population (60,000 pairs?) indicates that the number of nesting BFAL has continued to grow despite the head winds of longline by-catch and contaminants. We will never know the size of the BFAL population before the feather-hunting era, but the population now seems to be approaching an upper asymptote (i.e., carrying capacity) unless additional nesting locations such as Marcus Island become available.

These population trends are corroborated by at sea-surveys by Dr. David Ainley (pers. comm.) which indicate that BFAL have been increasing in the California Current. Most important, BFAL colonies in Japan have been founded or are expanding. Hiroshi Hasegawa (pers. comm.) has found the breeding population to be increasing and expanding on Torishima Island and in the Ogasawara (Bonin) Islands and expanding in the Senkaku Islands.[12] The founding of new BFAL colonies is a strong signal of population health in any species whose breeding strategy is geared to returning to its natal island.

V. Population Modeling

The USFWS and others have focused a great deal of attention on population modeling to determine whether the BFAL population is healthy. Population models are a tool that can provide important insights concerning biological processes and can identify areas for productive research. However, population models are a woefully inaccurate means of predicting population trends in BFAL. Their results should always be accompanied by a discussion of the biology of the species that inquires as to whether the results are reasonable using biological principles. No regulatory agency should rely on population models to predict trends when good empirical data (nest count) data is available. If a model predicts that a population is declining while empirical evidence indicates that a population is stable or increasing, common sense dictates that the empirical data is better. We are currently experiencing a large-scale economic trauma that has been caused by the underestimation of the risk of the complex mortgage securities by Wall Street computer models.[13] Given that those models were scrutinized by thousands of highly motivated

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[11] Harrison, Naughton and Fefer, p. 515.

[12] Naughton et al.'s ACAP report, Table 3, estimates about 2,500 BFAL nests in Japan.

[13] Hansell, S. How Wall Street Lied to Its Computers. New York Times (Sept.18, 2008).

financial experts and regulators, we ought to be especially cautious about relying on model results in the biological world where few scrutinize the models or their inputs and, as discussed below, most models are “black boxes” to everyone except those who construct the model..

Results from three recent BFAL population models have wrongly predicted that BFAL populations would decline.[14] The results from two of these models drove a foolish decision to deem BFAL as “endangered” when BirdLife/IUCN ignored a caveat that the trajectories were intended to illustrate what might happen to the population if no by-catch mitigation measures were implemented (and obviously measures were being implmented). Some models focus on occasional small negative changes in the rate of growth of nest counts and project a much diminished population size when a small (1-2%) rate of decline is extrapolated over 60 or more years. As discussed above, changes in observed nest counts can result from natural fluctuations and do not necessarily imply a change in a population. Wildlife “management” that essentially uses results from modeling noise in a population to determine that a species is endangered or threatened gives all serious conservationists a bad name, whether the USFWS for private conservation organziations. Lewison and Crowder’s model erroneously assumed that there was no BFAL by-catch in the 1960s and 1970s and produced results that double-counted BFAL taken in fisheries. The model did not acknowledge that its adult survival values (taken from published sources), included mortality from all sources including fisheries bycatch. Two researchers, one of whom has advised the Canadian federal government on the conservation status of BFAL, undertook a population model exercise that properly accounted for the double-counting found a much lower level of by-catch.[15] Unfortunately, publication of this study was blocked by an anonymous peer reviewer who disagreed with the approach. USFWS should be very wary of assuming that all divergent views are accounted for in the published literature. Another erroneous assumption in all current BFAL population models is that the survival rate of adult LAAL can be used for BFAL. Because the LAAL population is much larger and LAAL may have a faster population growth rate, this may not be a good assumption.

John Siebert, Manager, Pelagic Research Fisheries Program (PFRP), has provided about $500,000 for BFAL population modeling work. Siebert does not believe the current modeling efforts are credible and that the modelers are biased in only focusing on bycatch while ignoring other threats and trends in the BFAL population. Siebert wrote the following after a conference on modeling BFAL populations in November 2007, which he provided to me by electronic mail.

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[14] Veran, S., O. Gimenez, E. Flint, W. L. Kendall, P. F. Doherty and J. D. LeBreton, Quantifying the impact of longline fisheries on adult survival in the black-footed albatross. J. Applied Ecology (2007); Lewison, R. and L. B. Crowder, Estimating fishery bycatch and effects on a vulnerable seabird population. Ecological Applications 13: 743-753 (2003); and Cousins, K. and J. Cooper, The population biology of the Black-footed Albatross in relation to mortality caused by longline fishing. Honolulu: Western Pacific Regional Fishery Management Council. 120 pp. (2000).

[15] Wiese, F. K. and J. L. Smith, Effects of demersal longline fisheries in the Canadian Pacific on Black-footed Albatross (Phoebastria nigripes), unpublished manuscript (Enclosure 1).

> The PFRP committed a substantial amount of time and money to BFA [BFAL] modeling projects with very little to show for it.
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> To a large extent, this lack of progress is attributable to the unsatisfactory state of the available data - a problem that has persisted for more than 10 years. Given the possibility that BFA may be soon be listed as threatened or endangered and the costs to the public that will be incurred as a result, the deplorable state of the available data needs to be urgently addressed. It is not simply a matter of finding additional funding; it is a question of adjusting priorities and the responsible use of existing funds. Upgrading the BBL capabilities to accommodate albatross band resighting should be treated as urgent. The existing and undocumented data sitting in FWS files needs to be brought into the light and descriptive metadata should be posted made available to the research community (perhaps, as was discussed in the workshop, by posting on the NPAWG website). These criticisms of the BFA data are also applicable to many other protected species and better planning of data collection, storage and dissemination is needed in general.
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> Several workshop participants agreed to attempt to update the data used for the analyses presented at the workshop. Whether the agencies involved will actually produce the data is unclear.
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> It is widely acknowledged that albatross breeding success is mediated by environmental factors, yet the only covariates included in the population models pertained to fishing activities. BFA conservation plans that do only consider selected threats will not meet expectations and detract from the credibility of the responsible.

It is the essence of science that experiments, including “gedanken” or “thought” experiments with models, be repeatable and verifiable by others. If an experiment cannot be replicated, its results cannot be accepted as science in any scientific discussion. I am concerned that many if not all BFAL population models or inputs are not available so that neither I nor anyone else can use the identical models and test the effects of varying the inputs or algorithms. Without such transparency, no one can independently evaluate model results. I strongly suggest that in assessing the population status of the BFAL that USFWS rely on empirical data gathered by its own biologists (Table 1; Figure 1-20) and not “black box” population models that at some point are no more reliable than voo doo dolls. I have requested such data from one of the BFAL modelers and have received nothing. I believe that it would be arbitrary and capricious to list BFAL on the basis of population models and a violation of the ESA requirement that status reviews be based only on scientific information. I request that if the USFWS’ final decision uses results from any population model that I be provided with the software for the model and its inputs.

VI. Improvements in Bycatch Regulation

Given the population trends discussed above, even without the recent bycatch regulations the BFAL is neither endangered ("in danger of extinction throughout all or a significant portion of its range") nor threatened ("likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.") [16] This is an especially compelling conclusion considering the fact that the BFAL population increased during an era when there was much more bycatch than now. NOAA/NMFS and the fishing community are in a far better position to provide data on the vast improvements in fishery regulation since the petition was filed, and I understand that they have done so. Here I want to provide some personal context.

For the past 15 years I have worked as a board member of the American Bird Conservancy and as Vice-chair for Conservation for the Pacific Seabird Group to persuade federal regulators to strengthen regulations to limit seabird by-catch. For example, as recently as the beginning of this decade, Hawaiian fisheries were responsible for thousands of dead albatrosses each year -- more than any other fishery in the Western Pacific Management Region. The 2006 Annual Report on seabird interactions reflects a 90% decline in mortality since 2000 and the problem of seabird bycatch on Hawaiian longlines has been largely solved. Among the ways in which I assisted in these efforts was to send a Freedom of Information Act request in the mid-1990s to the National Marine Fisheries Service (NMFS) to obtain BFAL by-catch data because NMFS was refusing to provide that data to USFWS. Once I obtained it as a private citizen, I immediately provided that data to USFWS. There is no question that by-catch has been declining remarkably and I will continue to try to seek additional improvements where it is practicable. We do not now have and may never have "zero by-catch" fisheries, but the petition to list the BFAL does not seem to appreciate the vast amount of progress that has been made. The petition has a Rip van Winkle quality, awaking to decide the BFAL needs protection from fishery by-catch after such protection has already been implemented.

VII. Contaminants Issues

While the petition raises concerns about dichloro-diphenyl-trichloroethane (DDT), DDT's metabolite DDE, and polychlorinated biphenyls (PCBs), the population trends discussed above indicate that the BFAL is neither endangered nor threatened under the Endangered Species Act.[17] Two experts in wildlife contaminant issues -- Lloyd Kiff and Dr. Robert W. Risebrough -- agree with me that population counts are a much more reliable indicator of the health of a species than contaminant levels (pers. comm.). Before discussing technical issues, USFWS' findings and conclusions should identify the dozens of treaties, statutes and regulations that ban or regulate the dumping of harmful substances at sea or in coastal waters or bodies of water that drain to the sea. My coauthors and I addressed some of these several years ago, but without a focus on

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[16] 16 U.S.C. §§ 1532(6), (20).

[17] 16 U.S.C. §§ 1532 (6), (20).

contaminants.[18] Within the United States, the Clean Water Act, CERCLA (the legal basis for the Monsanto litigation in Southern California), and the banning of DDT (1972) and PCBs (1977) are pertinent. In the international arena, most nations are party to the London Dumping Convention and MARPOL. If there any inadequacies in existing treaties, statutes or regulations, USFWS should identify them.

It is surprising that one of the papers cited in the Federal Register notice suggests that DDT/DDE and PCBs in BFAL originate in North America, apparently assuming that satellite tracking showing BFAL feeding in the northeastern Pacific (a phenomenon that has been known for 30-40 years) is sufficient to conclude that there is a causal connection.[19] DDT and PCBs have been banned for 20-25 years in North America, and the expert work that led to a settlement of the Montrose litigation suggests that these substances have largely dissipated even where they were pumped into coastal waters on an industrial scale. Plastic ingestion may be one vehicle for PCBs to enter the bodies of albatrosses because PCBs accumulate on the surfaces of plastics in the ocean.[20] If DDT/DDE and PCBs continue to enter the marine environment today, the hypothesis that should be tested is whether those substances originate in Asia, particularly China.

The DDT/DDE and PCBs that are found in BFAL and LAAL are most likely dietary in origin, although the propensity for albatrosses on the colony to pick up and swallow objects (e.g., lead paint chips)[21] suggests that a terrestrial source should be considered. This important issue could be illuminated by testing BFAL at other colonies such as French Frigate Shoals and Laysan where the land has not been contaminated by 75 years of military activities. Finkelstein *et al*. are too simplistic in concluding that the diets of these two albatrosses are similar at the trophic level.[22] BFAL tend to follow ships and are called "the feathered pig" because they eat so much trash. During breeding, BFAL consume more flying fish eggs than LAAL, which may be ingested because flying fish deposit their egg masses on flotsam such as plastic.[23] Flying fish are a tropical and subtropical family and would not normally be found off the coast of North

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[18] Harrison, C. S., H. Fen-Qi, K. Su Choe, and Y. V. Shibaev. 1992. The laws and treaties of North Pacific rim nations that protect seabirds on land and at sea. Colonial Waterbirds 15: 264-277.

[19] Finkelstein, M. *et al*. 2006. Albatross species demonstrate regional differences in North Pacific marine contamination. Ecological Applications 16: 678-686.

[20] Carpenter, E. J., S. J. Anderson, G. R. Harvey, H. P. Miklas, and B. B. Beck. 1972. Polystyrene particles in coastal waters. Science 178: 749-750.

[21] Sileo, L. and S. I. Fefer. Paint chip poisoning of Laysan albatross at Midway Atoll. J. Wildlife Diseases 23(3): 432-437.

[22] Finkelstein. *et al*., p. 679.

[23] Harrison, C. S., T. S. Hida, and M. P. Seki. 1983. Hawaiian seabird feeding ecology. Wildlife Monographs. 85:1-71.

America. Thus there are ample differences in BFAL and LAAL diets that explain why BFAL have the highest contaminant loads of seabirds in Hawaii.[24]

Are the levels of PCBs and DDE/DDT a threat to the BFAL? First, it is no surprise that these compounds are found in Hawaiian seabirds. DDT/DDE and PCBs were detected in the **visceral fat** of BFAL and LAAL as early as 1969.[25] Dr. Ohlendorf and I analyzed **eggs** from sooty terns, wedge-tailed shearwaters and red-footed boobies from Oahu, French Frigate Shoals, Laysan and Midway Atoll in 1980. We detected mercury, DDE and PCBs in most species at most locations.[26] We found the highest concentrations of PCBs in wedge-tailed shearwater eggs on Oahu, where the mean was 0.122 mg/kg ww and the high for an individual birds was 0.211 mg/kg ww.[27] Finkelstein *et al*. found BFAL to have PCB levels in **blood plasma** of 160 ng/mL (range 77-460),[28] but there is no reliable way to compare PCB levels in visceral fat, eggs and blood plasma. Dr. Robert W. Risebrough has found no convincing evidence that PCBs have contributed to population declines of any avian species despite deleterious effects found in laboratory work (pers. comm.).

Brown pelicans are thought to be the most sensitive of any avian species studied for organochlorines such as DDT/DDE.[29] The severe eggshell thinning and breeding failures of brown pelicans in Southern California in 1969-1970 were triggered by DDE levels of 30-34 mg/kg when industrial volumes of DDT flowed into coastal waters.[30] Breeding failures had ceased by the mid-1980s when levels of 2 mg/kg in pelican eggs were attained.[31] The brown pelican population prospered at DDE levels of 2mg/kg in eggs, as evidenced by the decision of USFWS that the species if fully recovered and the Service's proposal to remove it from the list of endangered and threatened species.[32] Dr. Ohlendorf and I found the highest concentrations of

[24] Harrison, Hida and Seki, Tables 3 and 6.

[25] Fisher, H. I. 1973. Pollutants in North Pacific albatrosses. Pac. Sci. 27: 220-225.

[26] Ohlendorf, H. M. and C. S. Harrison. 1986. Mercury, selenium, cadmium and organochlorines in eggs of three Hawaiian seabird species. Envtl. Poll. (Series B) 11:169-191.

[27] Ohlendorf and Harrison, Table 2.

[28] Finkelstein *et al*., Table 1.

[29] Blus, L. J. 1982. Further interpretation of the relation of organochlorine residues in Brown Pelican eggs to reproductive success. Environ. Pollut. (Ser. A) 28: 15-33.

[30] Shields, M.. 2002. Brown Pelican (*Pelicanus occidentalis*). Birds of North America No. 609. Cornell Laboratory of Ornithology and The Academy of Natural Sciences, p. 24.

[31] *Id*.

[32] USFWS, Listed Distinct Population of Brown Pelican (Pelecanus occidentalis) 5 Year Review: Summary and Evaluation (April 2007); 73 Fed. Reg. 9408-9433 (February 20, 2008).

DDE in our Hawaii study to be in wedge-tailed shearwater eggs at French Frigate Shoals, with a mean of 0.592 mg/kg ww and a high for an individual bird of 0.923 mg/kg ww.[33] The most recent measurement of DDE in BFAL eggs that I can find (1992-1993) is 1.55 mg/kg in BFAL,[34] about 5% of the levels in Brown Pelican eggs when they had complete reproductive failures. Dr. Ohlendorf has observed that this level is not particularly high (pers. comm.). In 2006 Finkelstein *et al.* reported BFAL to have DDE levels in blood plasma of 125 ng/mL,[35] but there is no direct or reliable way to compare this to DDE levels in eggs.

I can find no reported empirical evidence of reproductive failures of BFAL, and with empirical data showing healthy nest counts there is no basis to conclude that they are in danger of extinction either now or in the foreseeable future. The published literature reports DDE levels from a variety of different tissues (blood plasma, visceral fat), but all too rarely for the most important one (eggs). The reports of contaminants are much to focused on Midway Atoll, and other locations should be tested. I suggest that research address the following:

- What are the levels of PCBs in eggs or blood plasma throughout the range of BFAL?

- What are the levels of DDE in eggs throughout the breeding range of BFAL (including Japan)?

- Are reproductive failures due to eggshell thinning occurring at any BFAL colony?
-

If you have any questions on these comments, please call me at (202) 778-2240.

Sincerely,

Craig S. Harrison

Enclosure

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[33] Ohlendorf and Harrison, Table 2.

[34] H. I. Auman et al. 1997. PCBs, DDE, DDT and TCDD-EQ in two species of albatross on Sand Island, Midway Atoll, North Pacific Ocean. Env'tl Toxicology and Chem. 16: 498-504, Table 5.

[35] Finkelstein *et al*., Table 1.

Figure 1. Midway Island Counted Nests Linear Correlation. 1992 to 2008 Data.

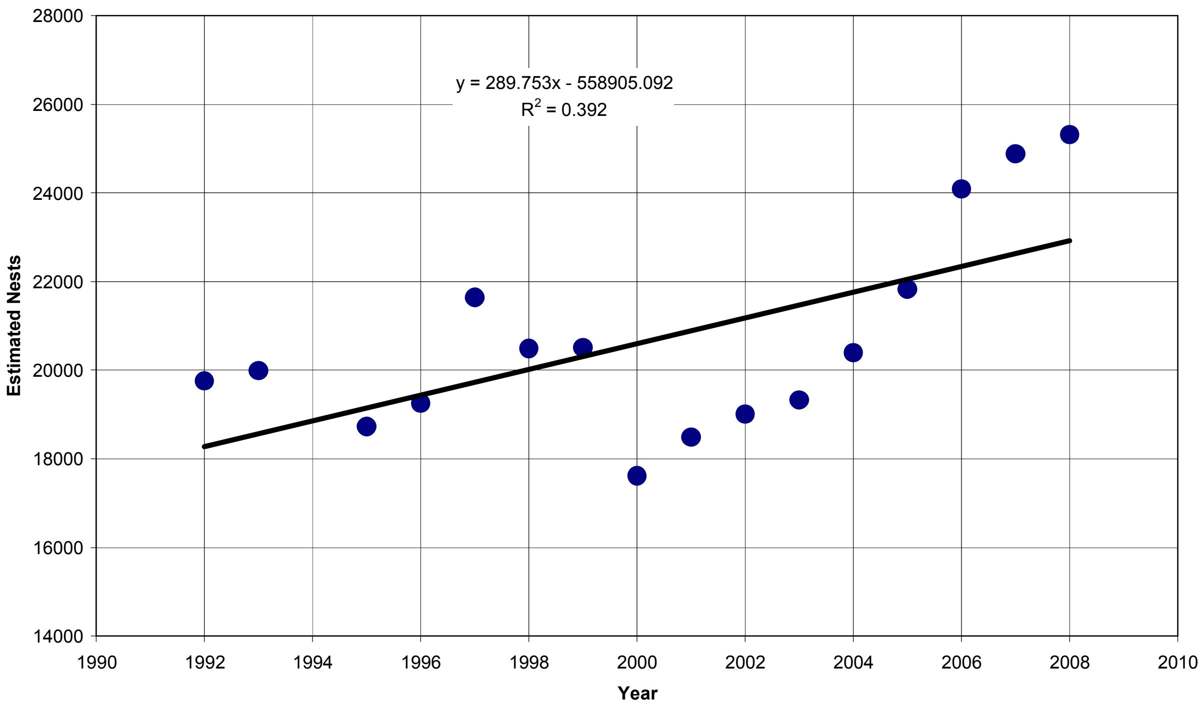

Figure 2. Midway Island Counted Nests Polynomial Correlation. 1992 to 2008 Data.

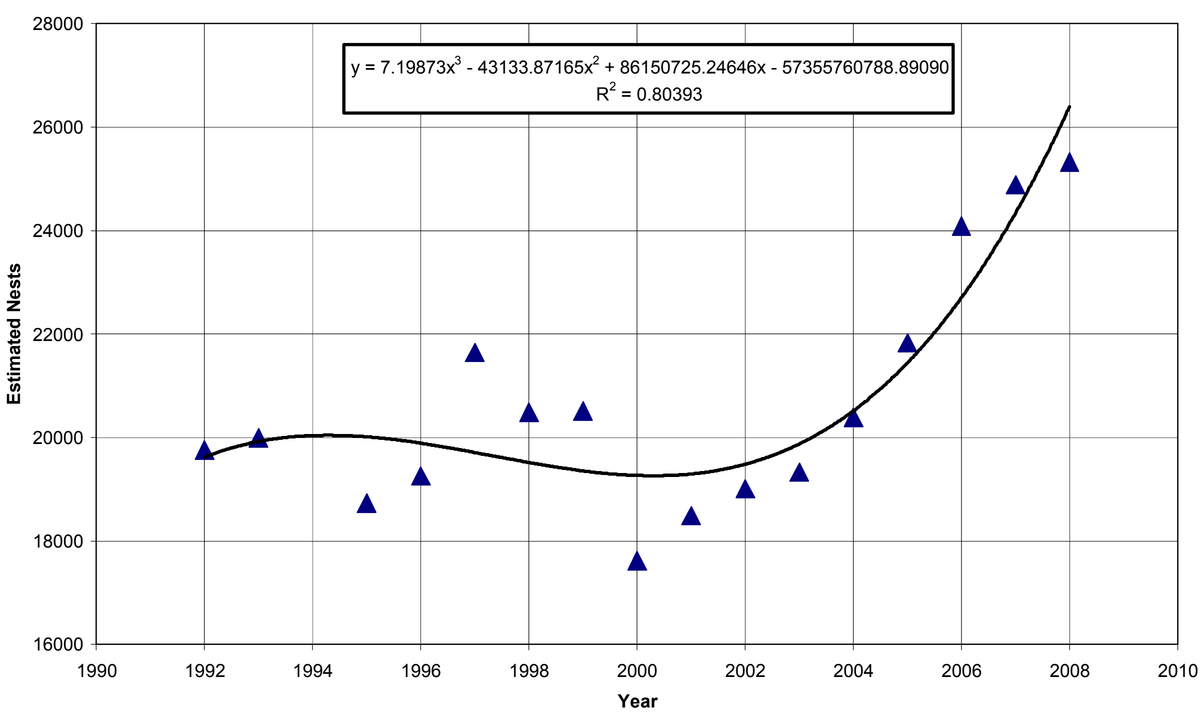

Figure 3. Midway Island Counted Nests Linear Correlation. 1998 to 2008 Data.

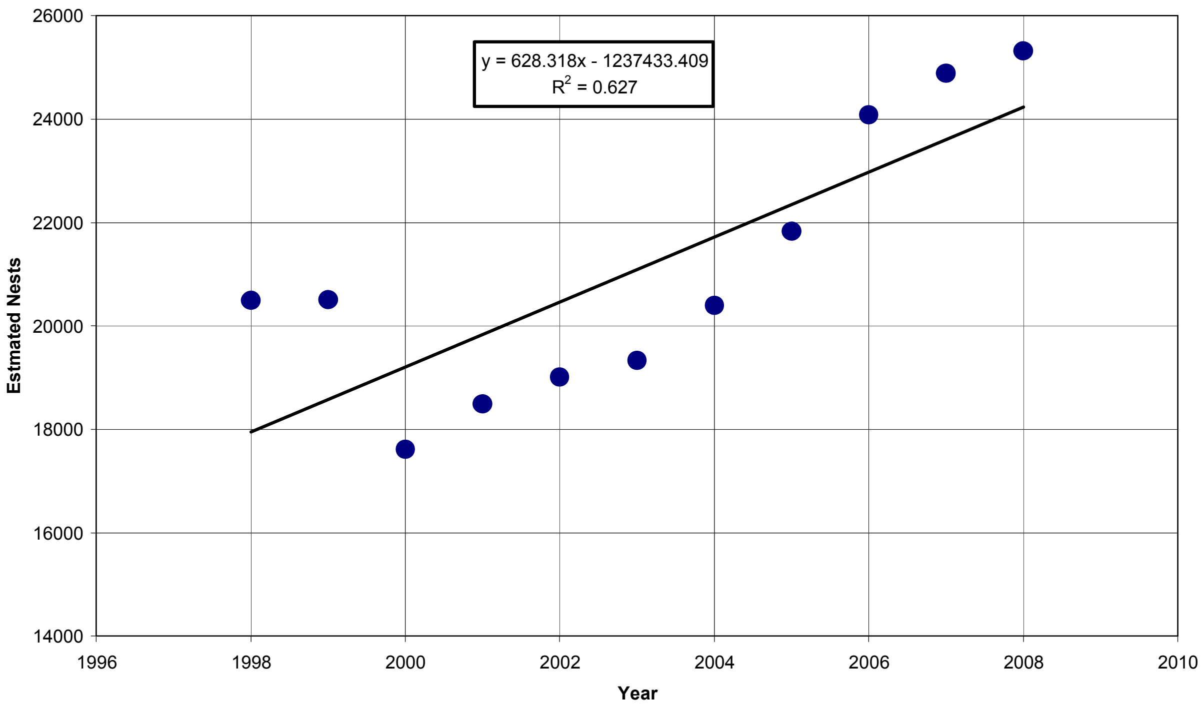

Figure 4. Midway Island Counted Nests Polynomial Correlation. 1998 to 2008 Data.

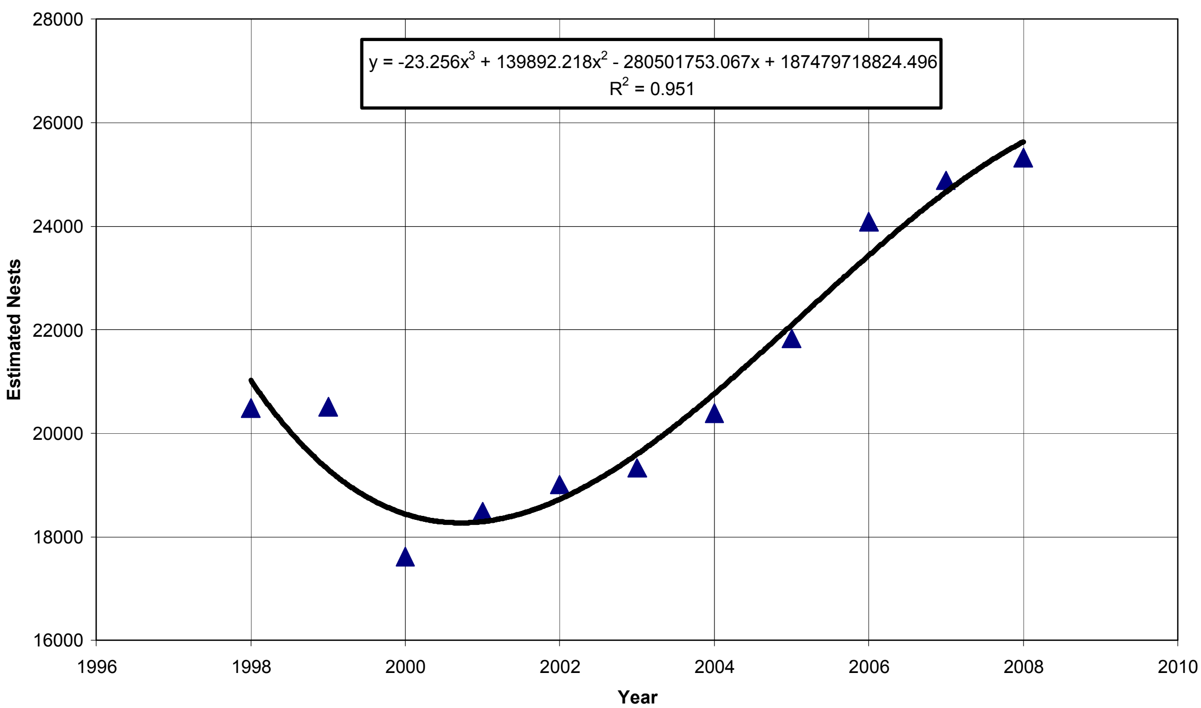

Figure 5. French Frigate Shoals Counted Nests Linear Correlation. 1992 to 2007 Data.

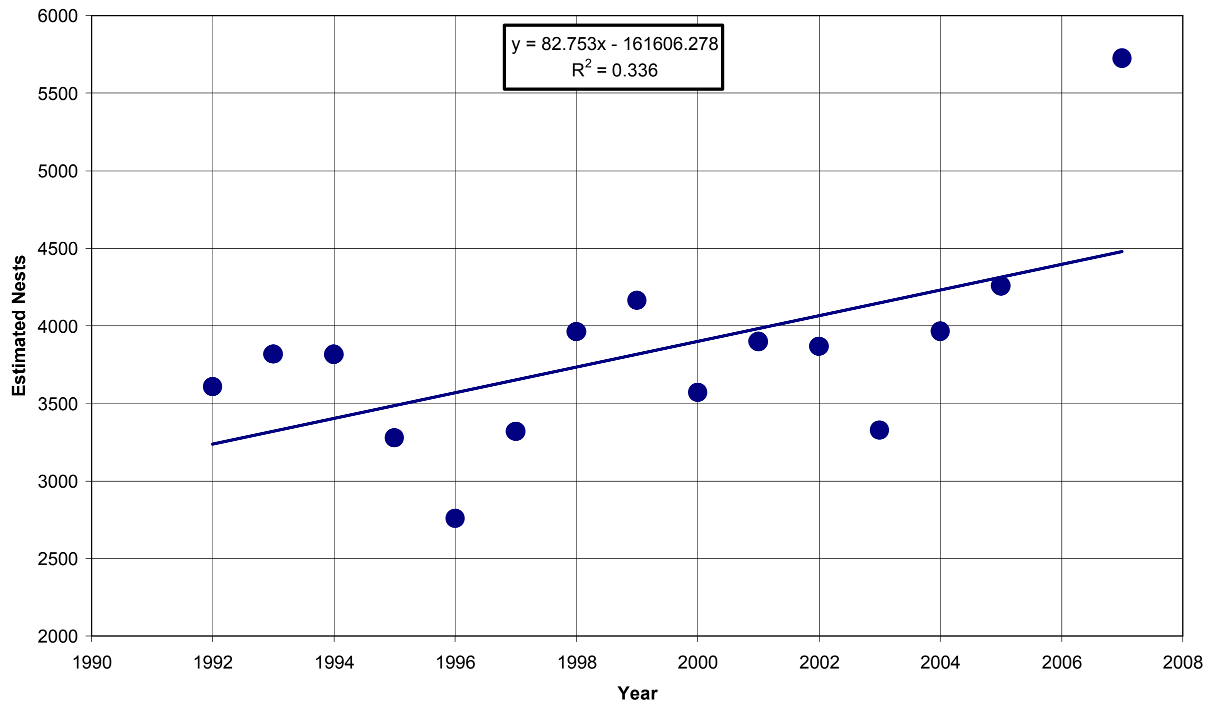

Figure 6. French Frigate Shoals Counted Nests Polynomial Correlation. 1992 to 2007 Data.

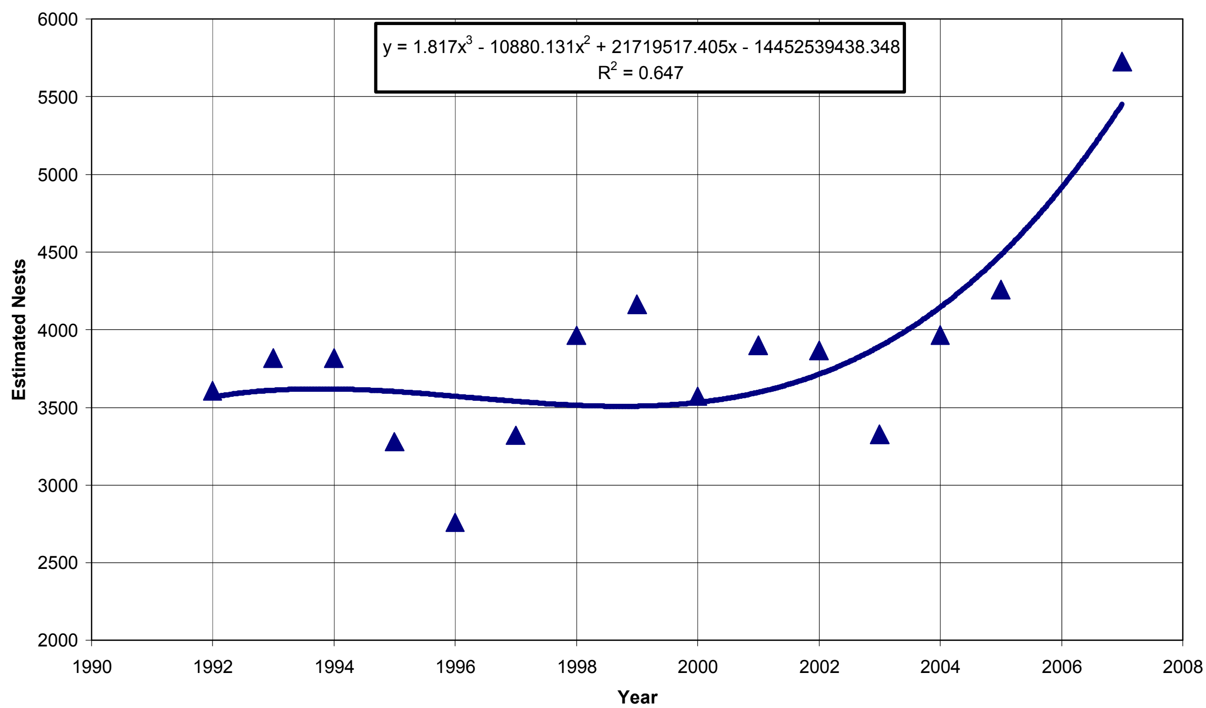

Figure 7. French Frigate Shoals Counted Nests Linear Correlation.
1998 to 2007 Data.

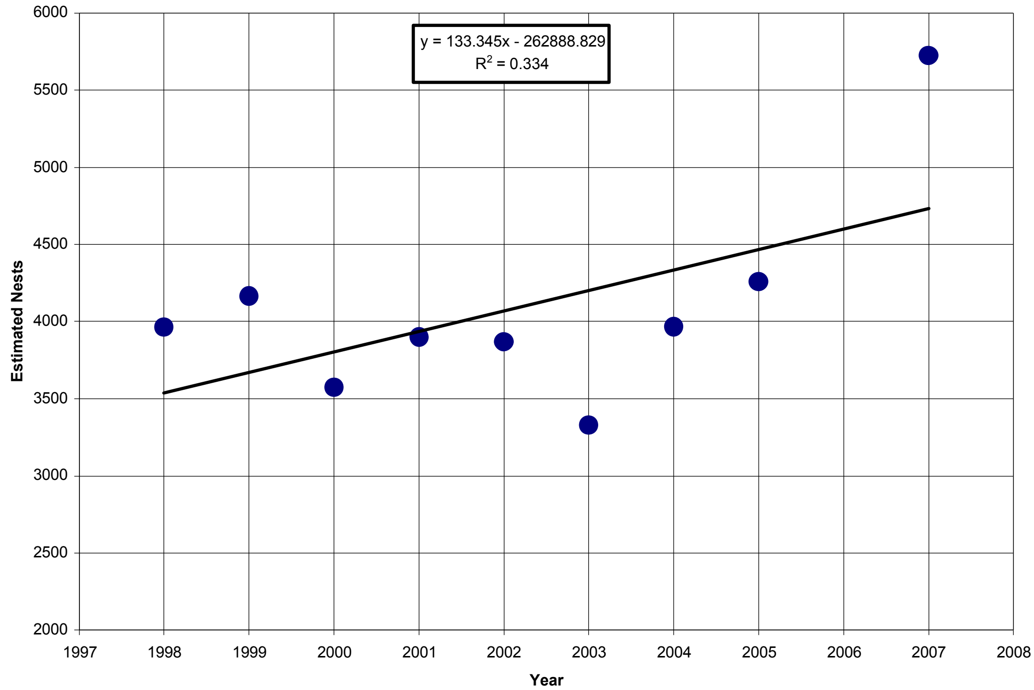

Figure 8. French Frigate Shoals Counted Nests Polynomial Correlation.
1998 to 2007 Data.

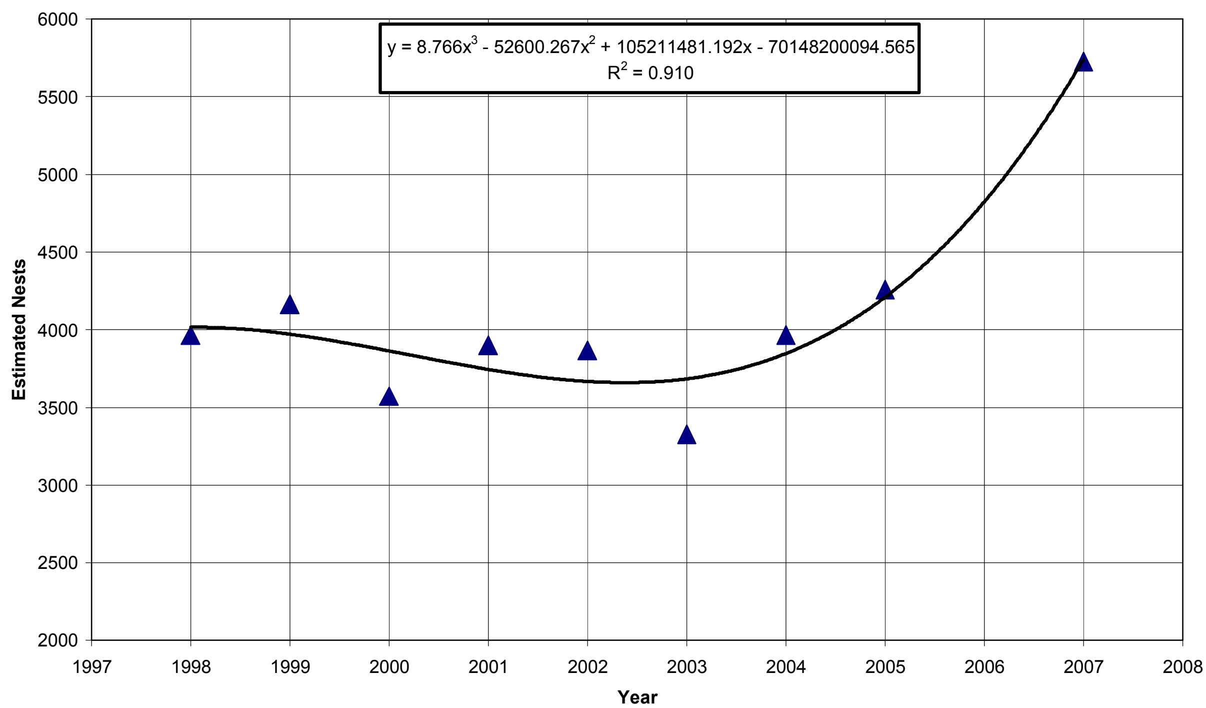

Figure 9. Laysan Island Estimated Nests Linear Correlation. 1992 to 2008 Data.

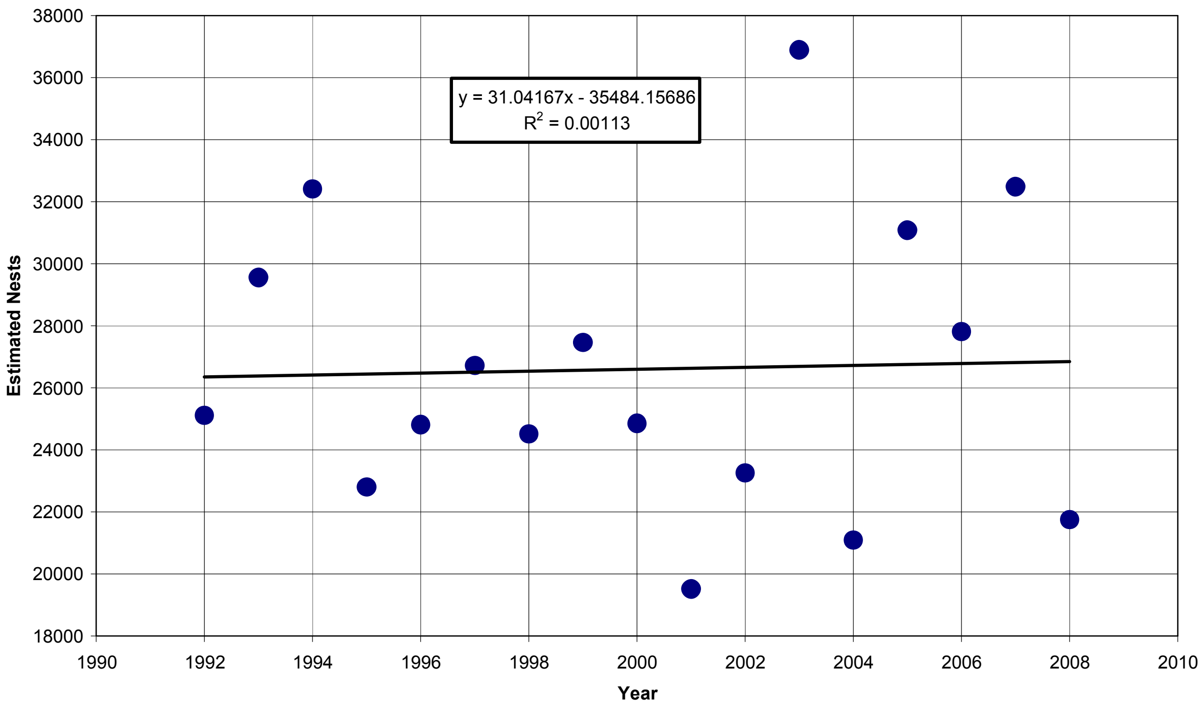

Figure 10. Laysan Island Estimated Nests Polynomial Correlation. 1992 to 2008 Data.

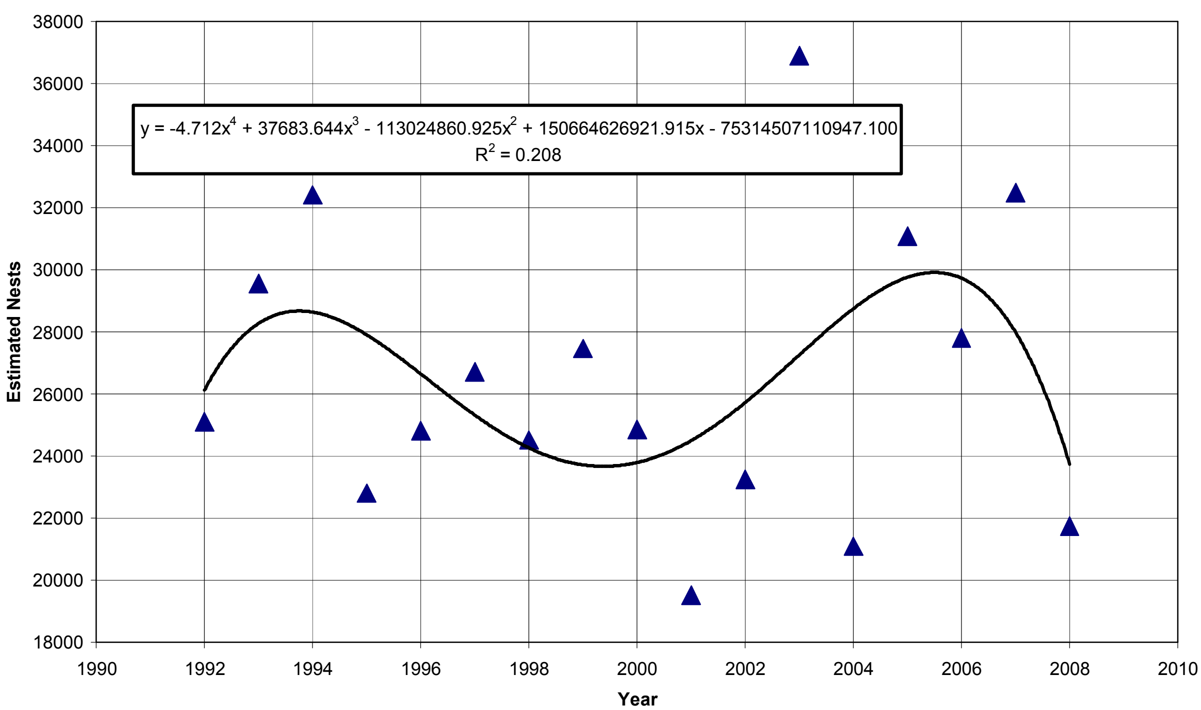

**Figure 11. Laysan Island Estimated Nests Linear Correlation.
1998 to 2008 Data.**

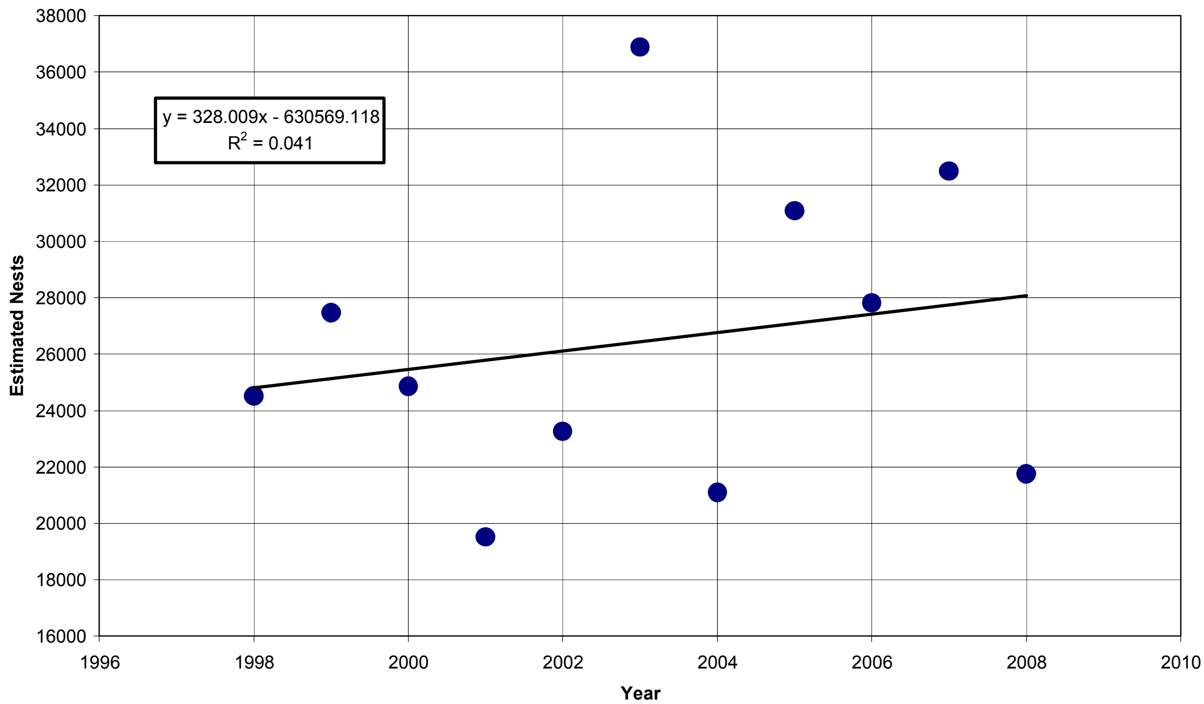

**Figure 12. Laysan Island Estimated Nests Polynomial Correlation.
1998 to 2008 Data.**

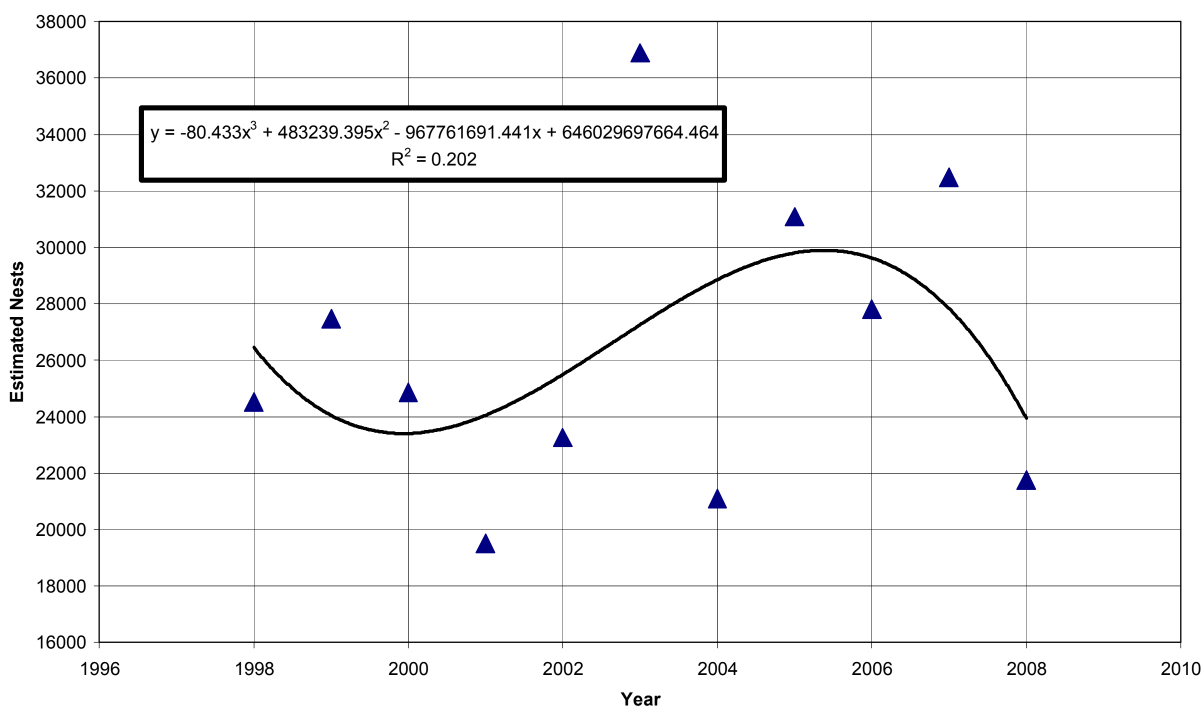

**Figure 13. Laysan Island Counted Nests Linear Correlation.
1998 to 2008 Data.**

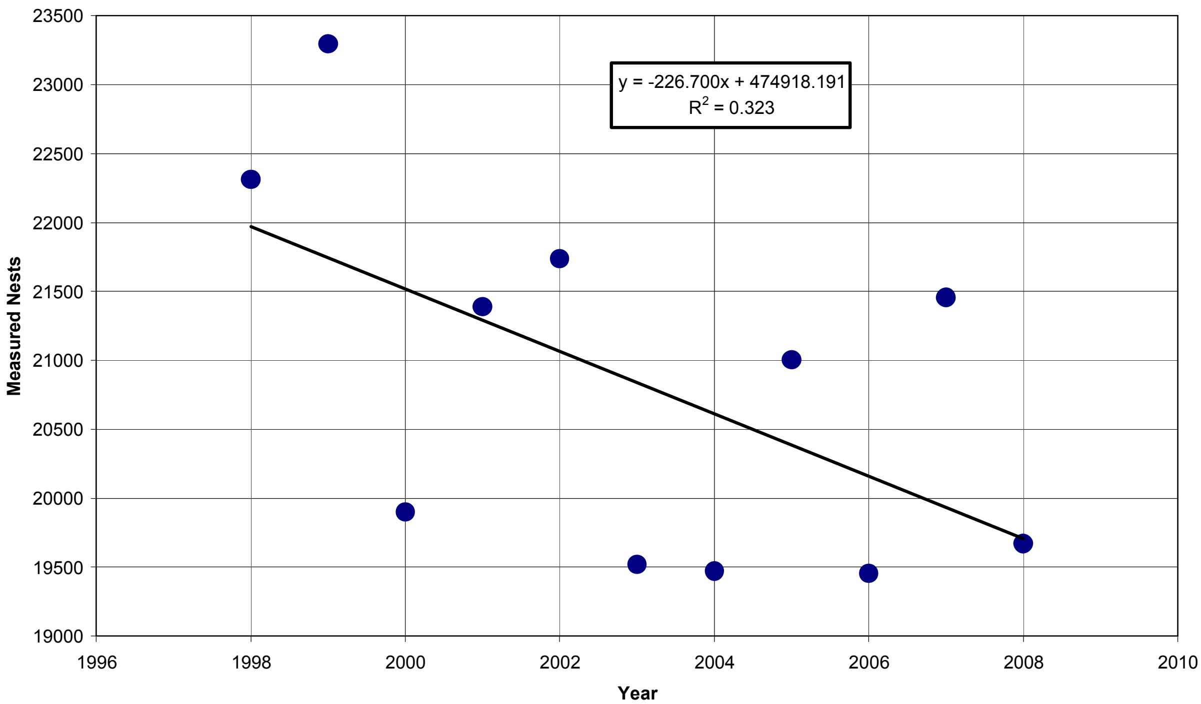

**Figure 14. Laysan Island Counted Nests Polynomial Correlation.
1998 to 2008 Data.**

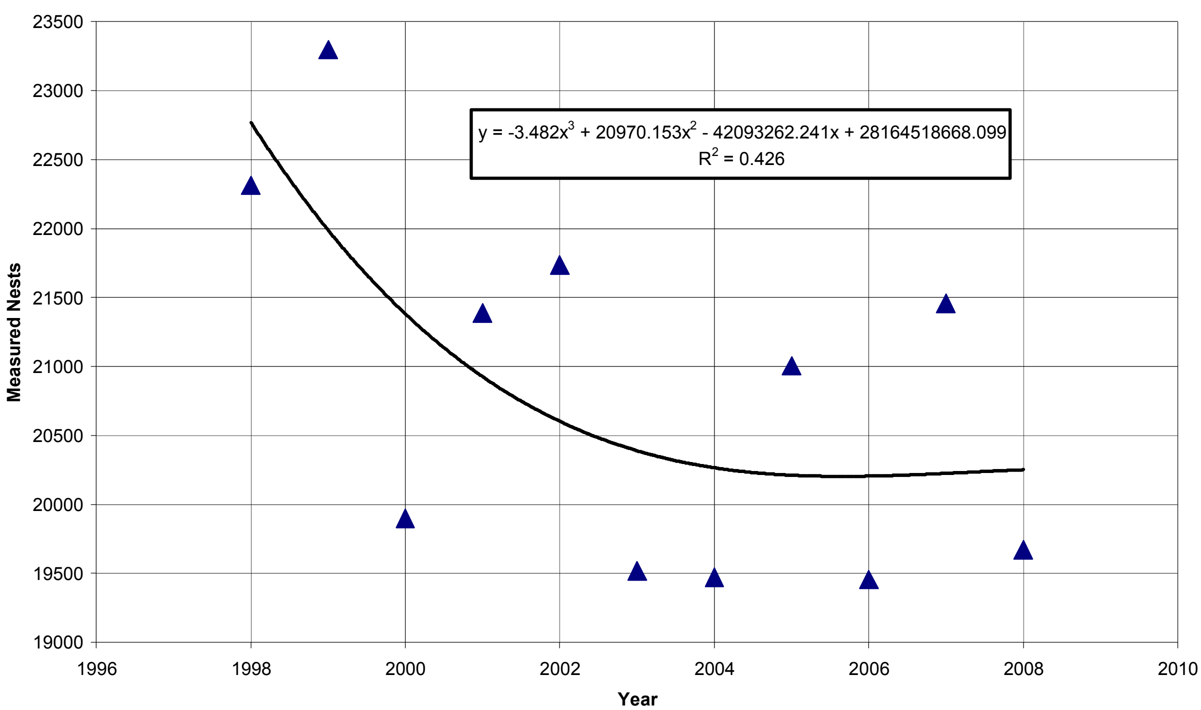

Figure 15. Estimated Composite Albatross Population Linear Correlation. 1992 to 2007 Data (Quadrat Method at Laysan Island).

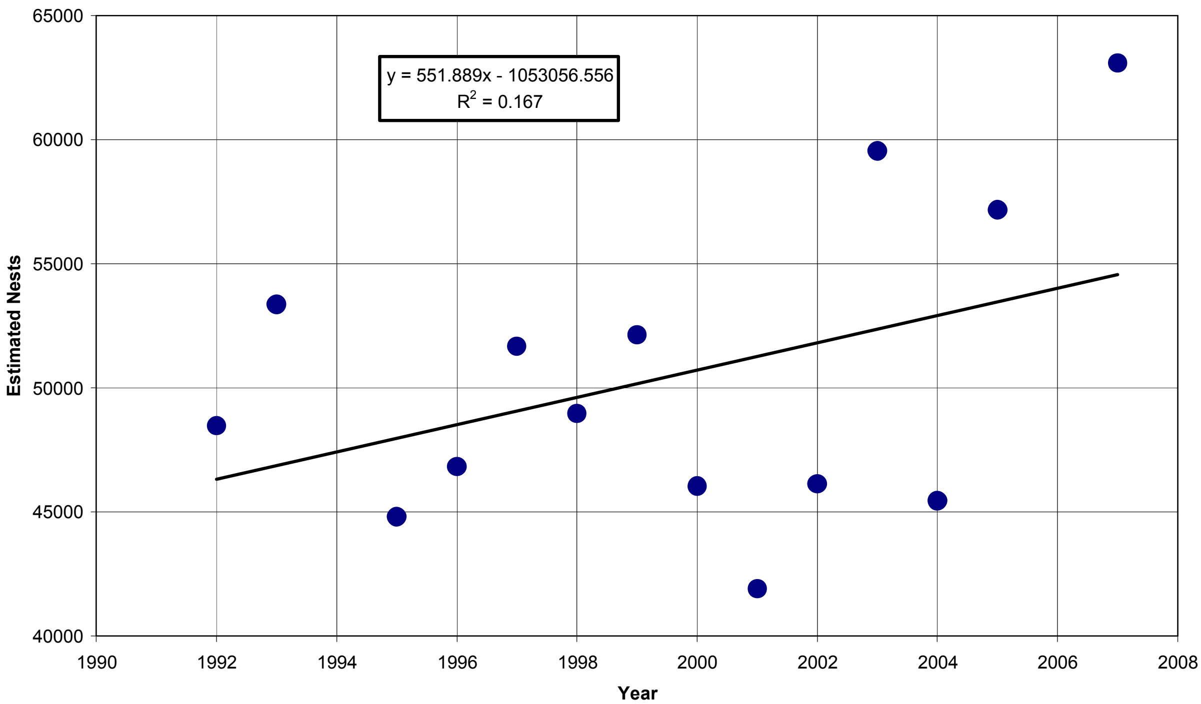

Figure 16. Estimated Composite Albatross Population Polynomial Correlation. 1992 to 2007 Data (Quadrat Method at Laysan Island).

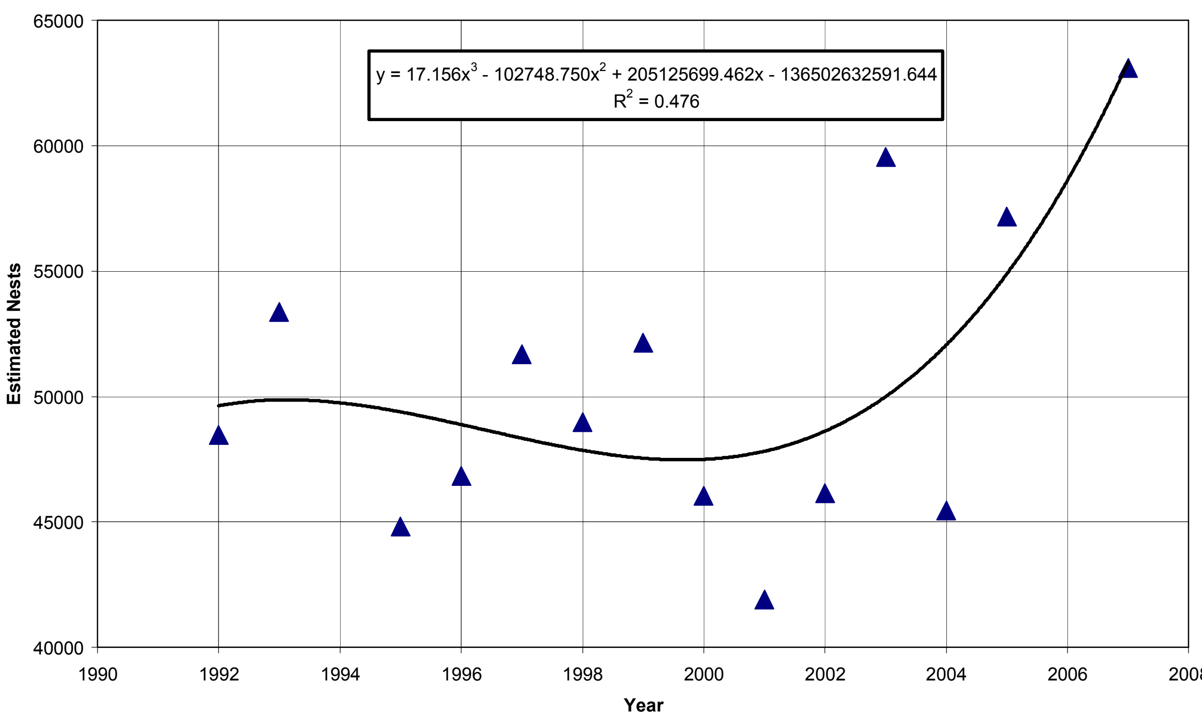

Figure 17. Estimated Composite Albatross Population Linear Correlation. 1998 to 2007 Data (Count Method at Laysan Island).

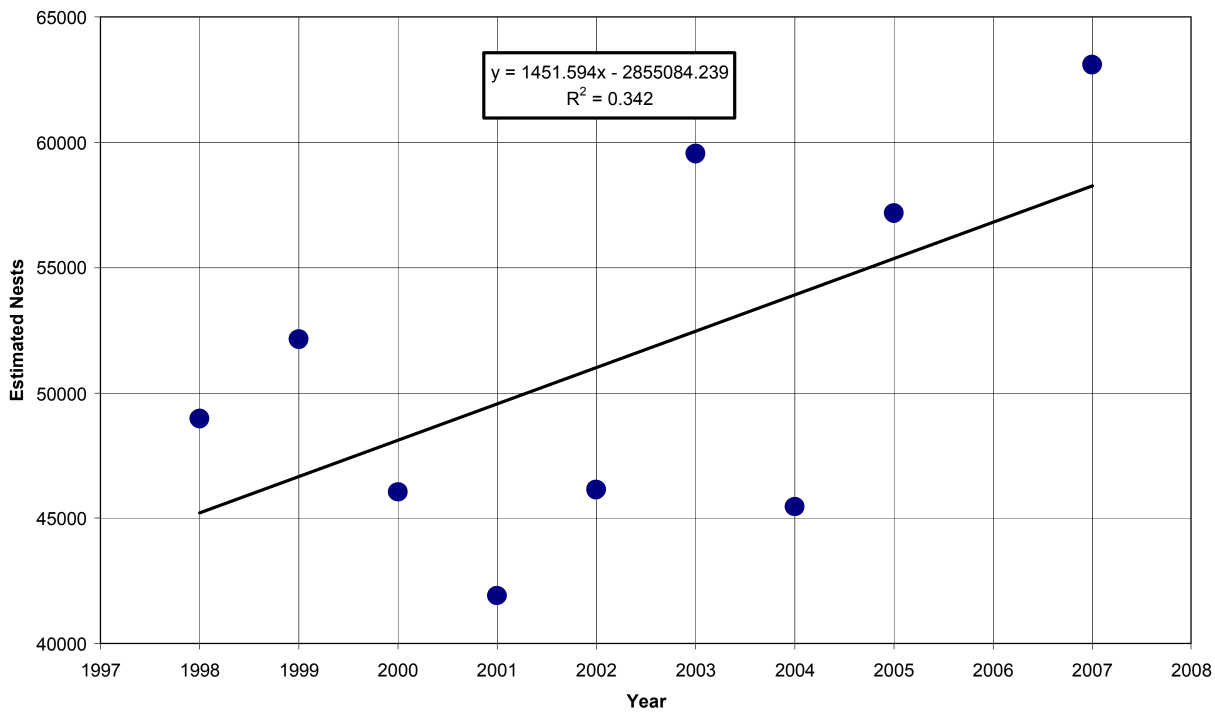

Figure 18. Estimated Composite Albatross Population Polynomial Correlation 1998 to 2007 Data (Count Method at Laysan Island).

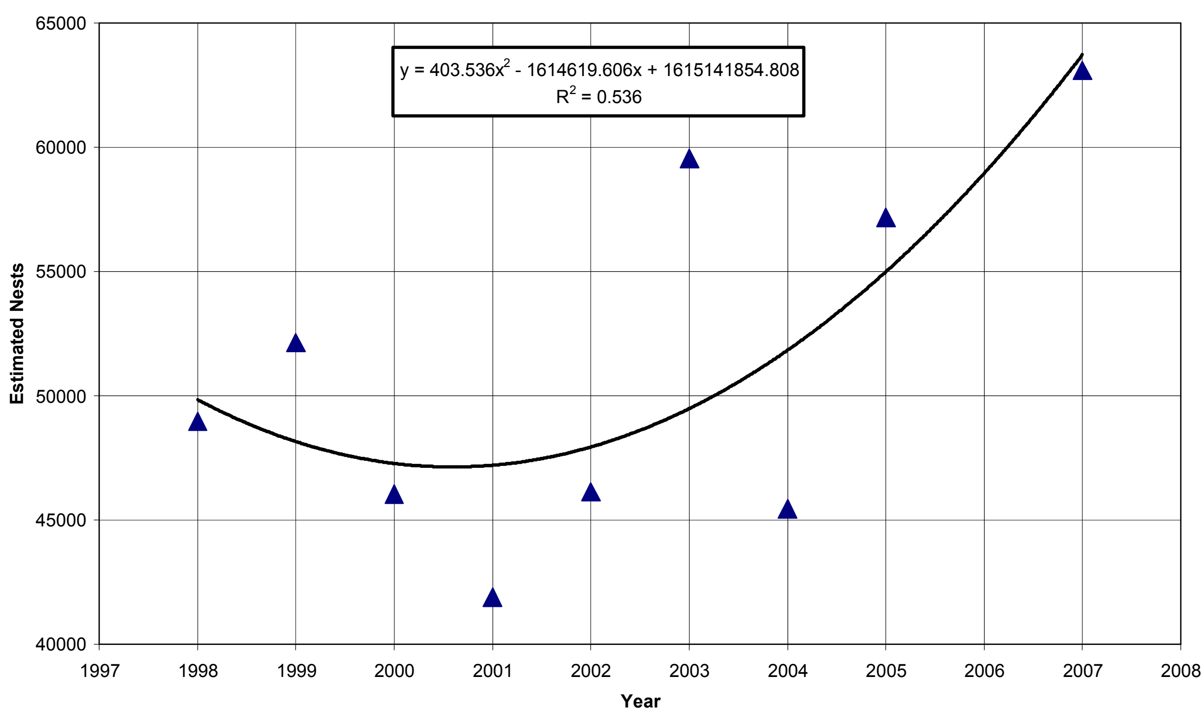

Figure 19. Estimated Composite Albatross Population Linear Correlation 1998 to 2008 Data (Midway and Count Method at Laysan Only).

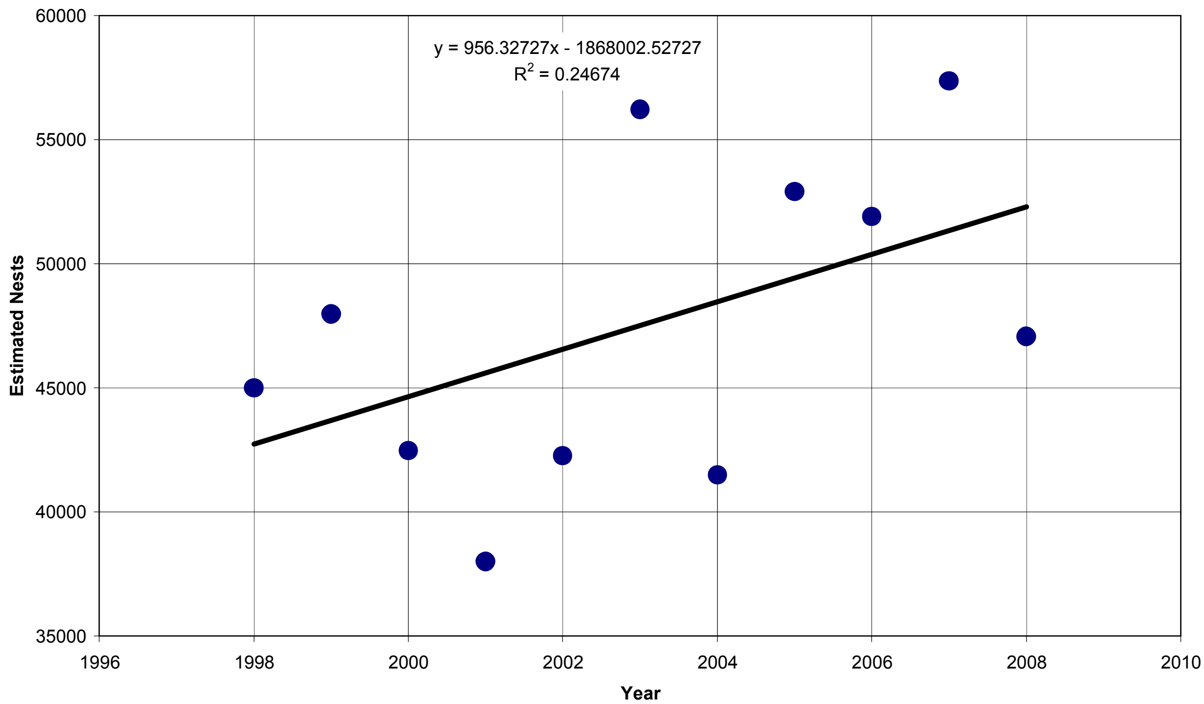

Figure 20. Estimated Composite Albatross Population Polynomial Correlation 1998 to 2008 (Midway and Count Method at Laysan Only).