RESEARCH PROGRESS REPORT
For Administrative Use

1962 REPRODUCTIVE SUCCESS
IN
NORTH AMERICAN GEESE

Winter Appraisals of Productivity

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ABSTRACT

An occasional year of poor reproductive success is no novelty among Arctic-nesting birds. Conservationists have become reconciled to this fact, although they still shudder at the possibility of poor hatches two years in a row among heavily-hunted waterfowl that nest in the Far North. Productivity data we now have for 1961 and 1962 suggest that environmental conditions in the North were generally unfavorable for Arctic geese during these two consecutive breeding seasons. Yet the snows and blues, white-fronted geese, and so far as we know the other Northern-nesting geese and swans, did much better in 1962 than in their 1961 nesting. What may have made the difference in 1962 was the relatively large proportion of mature breeders in the nesting populations that season, breeders that were already experienced, and able better to cope with unfavorable nesting conditions.

INTRODUCTION

Every nesting season leaves a record of its success or failure that is visible in fall populations of the geese, swans and brant. Appraisals of annual productivity among these birds are therefore conducted during fall and winter, rather than during the summer breeding season. Field surveys scan fall-migrant and wintering flocks, recording the number of distinctively colored first winter young, and/or prevalence of family and non-family groupings. From these evidences of productivity is developed a picture of annual increment and mortality for each species. The many observers whose efforts make these surveys possible are constantly afield and in intimate contact with their subjects, and so they are in a position to contribute much timely information as to biological (as well as arithmetical) aspects of current welfare of wildfowl. It had been the practice in past years to list all these cooperators, but in 1962 (very fortunately for the surveys) they are too many to enumerate. Their collective enthusiasm and competence is herewith acknowledged; individual contributions are identified in the text.

Information from these many observers is collected and analyzed in the Branch of Wildlife Research, Bureau of Sport Fisheries and Wildlife. Annual reports, prepared for the information of wildlife administrators and survey cooperators, are on file at Patuxent Wildlife Research Center, Laurel, Maryland and at its Lafayette, Louisiana field station.

NOTE: A previous report, "Winter Appraisals of 1960 Productivity in North American Geese" presents detailed instructions for conducting these winter surveys; copies of that report may be had by writing to U. S. Fish and Wildlife Service, Box 477, U. S. L. (University of Southwestern Louisiana), Lafayette, Louisiana 70506.

SECTION I. THE BLUE GOOSE IN 1962*

About one third (32.1%, Table 1) of blue geese that came to Louisiana and Texas in the fall of 1962 were young of the year. This suggests satisfactory reproductive success for the 1962 season. The annual (calendar year) loss of 25 to 35% of adults and subadults that is to be expected in this species should be offset by such productivity; the January 1963 inventory assures us that annual increment more than compensated for mortality in 1962.

While this 1962 hatch can be considered adequate, it would not qualify as "outstanding" as we usually employ the term. The blue goose went into this nesting season with a breeding population that was robust not only in its large number of mature (24+ months) birds, but also in the high percentage of these that should have been experienced breeders (36 months or older) in midsummer 1962.

Yet the broods they brought to the wintering grounds in 1962 had fewer young than usual (1.9 per 1962 fall family, Tables 1 and 5). Of greater import was the large number of adult plumaged blues that had no young. Ninety-two percent of these "whiteheads" were 24 months old or older by June 1962, and therefore should have been eligible to nest that season. Sixty-three percent of these were over 36 months of age, and presumably had already been through the experience of at least one nesting season. Only 43% of adult appearing birds (less than half of eligible adults and equivalent to only 2/3 of those thought to be experienced adults) succeeded in bringing young to the wintering grounds.

Part of the fall 1962 migration of blues and snows was greatly retarded, with many south-bound birds lingering in the Northern Great Plains throughout October. 81,000 snows and blues were still at Sand Lake NWR, South Dakota on October 29, and over 20,000 remained there by midNovember (report of R. F. McWhorter). This brings up the possibility that hunting of tardy migrants might have been responsible, at least in part, for the rather small goose families and other evidences of low productivity among geese that reached the wintering grounds this fall.

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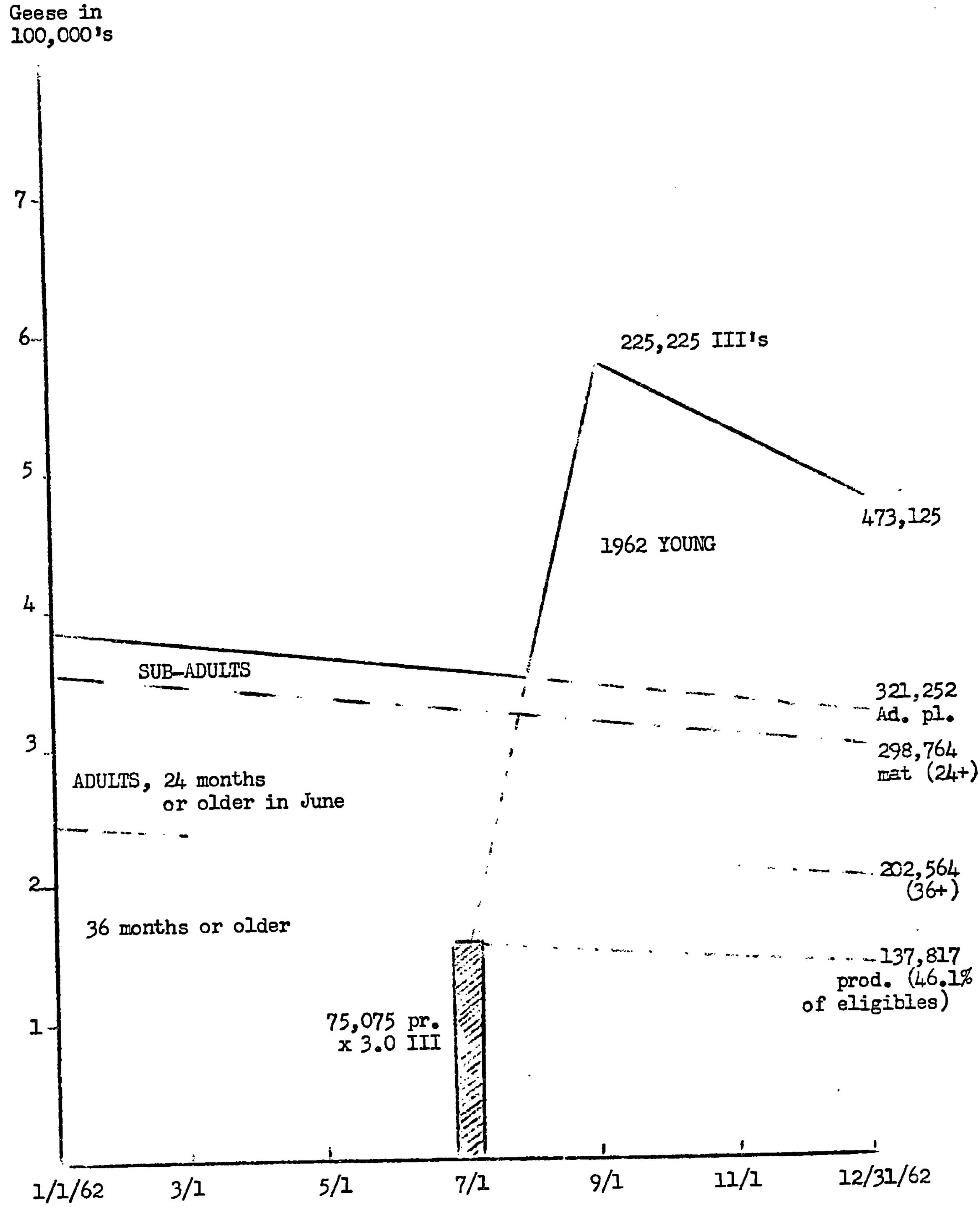
*Surveys by John Lynch, Ralph Andrews, Jake Valentine and Art Brazda of BSFW, Robert Chabreck and C. W. Hoffpauir of La. Wild Life and Fisheries Comm., and Charles Stutzenbaker, Clarence Beezley, and cooperators of Texas Game & Fish Comm.

FIGURE A. BLUE GOOSE: 1962 Population Plot



Our appraisal data enable us to examine this possibility. As fall-migrant goose families are gunned en route south, parents as well as young are removed from family groups and the latter show up in winter counts as single-adult families and stray young. Thirteen percent of blue goose families had only one surviving parent when they reached the Gulf Coast in fall 1962. But this is quite normal and represents no great change from the 14% single-adult figure of fall 1960, and 18% for 1961. As usual, fewer 1-adult families were tallied in the lightly-hunted SE Louisiana geese that seldom tarry on their way south; in fall 1962 Texas counts, 1-adult families ran as high as 25% of total families.

Stray young blues (orphans not accompanied by parents) amounted this fall to 6% of all young blues in Gulf records. This also is a normal percentage for stray young in winter surveys. So it would appear that hunting mortality among tardy 1962 fall-migrant blues was not much greater than usual, and certainly was not the sole cause of small broods and other evidences of less-than-capacity reproduction.

There is much to suggest that the 1962 hatch was late, or perhaps was interrupted in some regions after a normal start. Small broods are symptomatic of late hatches. Many young blues were slow this past winter in changing from their dark first winter plumage to their "eagle head" yearling dress. Gulf observers noted that some wintering flocks yielded a monotonously long record of families having only one, or at the most two youngsters, the latter being quite dark. Occasionally the monotony would be relieved by a series of families having three or more young, and as winter advanced these youngsters developed white heads on schedule, in contrast to the much delayed plumage change of young in the small families. It seemed as though a few blue geese might have managed to bring off early (and therefore large) broods in 1962. Whereas the majority of breeders either started nests late or had their first nesting interrupted and had to make another start. Special midwinter and late winter family counts were made, to see whether two dominant brood-sizes could be detected. These produced a semblance of a bimodal brood curve that tended to peak at one and three young, but the two peaks were not clear-cut.

Aside from these minor differences in prevalence of young, the fall and winter 1962 blue goose records did not show important variability. So they have been totaled directly in Table 1 without stratification or other weighting. They suggest that the 1962 blue goose nesting season, while not exceptional in terms of total young produced, may have been outstanding in other ways. 1962 nesting conditions for blues (weather and other physical considerations) were somewhat better than those that prevailed in the dismal 1961 season, but differences were not so great as to offer a ready explanation for the nature and amount of 1962 productivity. Differences in breeding populations must also be considered (Figures A & E this report, and Figure A of 1961), because the blue geese that went into the 1962 nesting were, in numbers of mature and experienced adults (Table 5), capable of shattering all recent records for productivity. These birds returned south in the fall of 1962 like seasoned veterans, not in triumph yet in splendid order. Apparently they had been through a rugged campaign, that called for maximum effort with relatively small rewards, but they (and their species) won it.

SECTION II, THE LESSER (WESTERN) SNOW IN 1962*

The agreement among our fall 1962 records of Lesser snow goose productivity (Table 2) is worthy of note. This bird has a vast nesting range that takes in parts of Siberia as well as much of the top-side of North America. In this great span of geography, a variety of nesting conditions could be expected to prevail in any one breeding season. Yet the lesser snows that came south in the fall of 1962, whether to Pacific or Gulf winter-quarters, showed almost identical evidences of reproductive success.

Twnety-nine percent of snows in our fall and winter counts were young from the 1962 nesting. Of adult-plumaged snows, 34.5% brought young south with them, in families that averaged 1.95 youngsters. The productive adults amounted only to 43.1% of snows 24 months old in the summer of 1962 (and therefore eligible to nest that year). They represented only 72% of birds that should have been 36 months old at that time, and presumed to have been experienced nesters. These data evince reproductive success that was adequate, but was perhaps accomplished in the face of difficulties.

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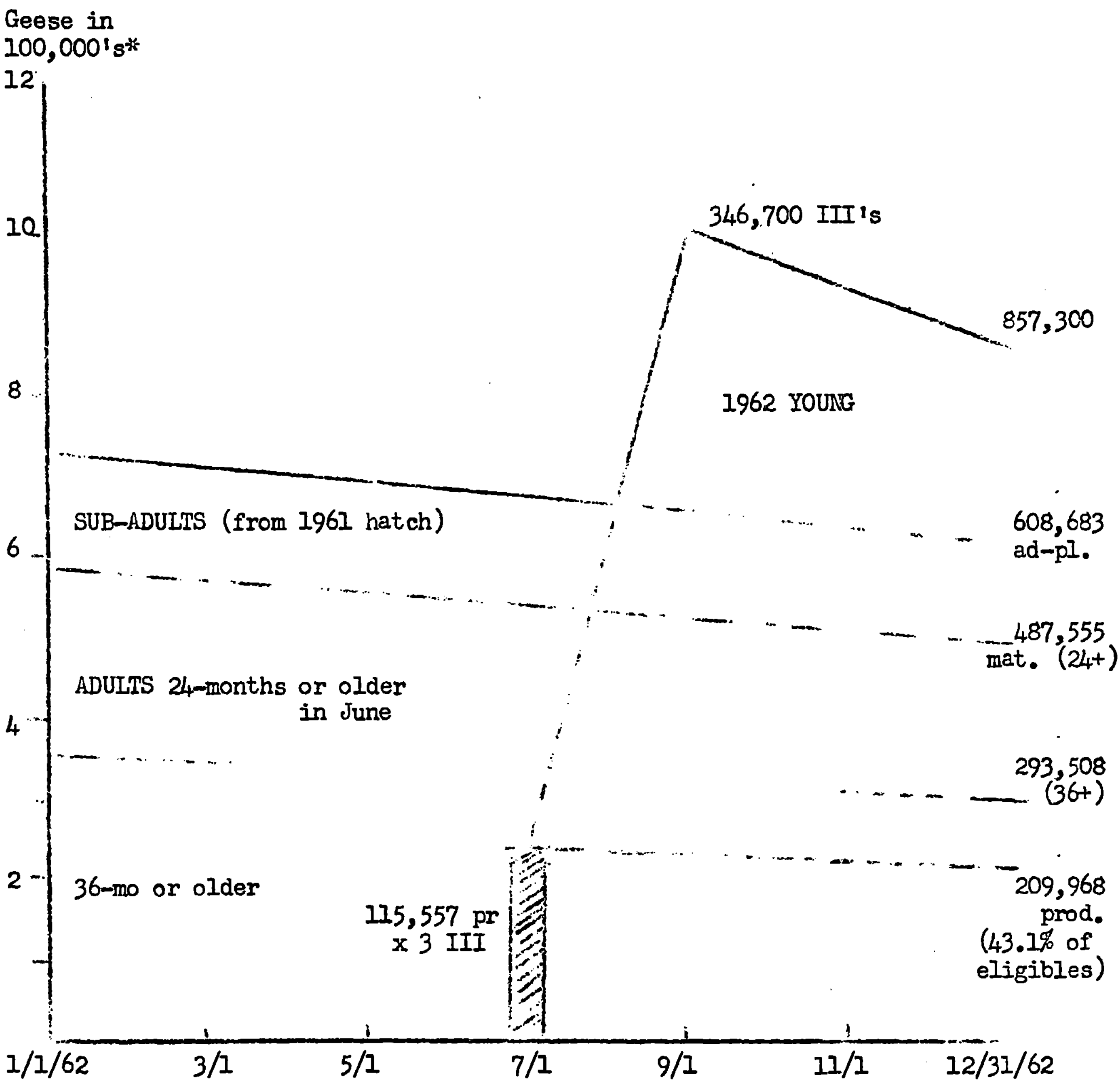
*Surveys in Texas by Charles Stutzenbaker with C. Beezley and other Texas Game and Fish Dept. cooperators; in Pacific Flyway by G. Hortin Jensen and cooperators; in Louisiana by the Federal-State Blue Goose team.

FIGURE B. LESSER (WESTERN) SNOW: 1962 Population Plot.



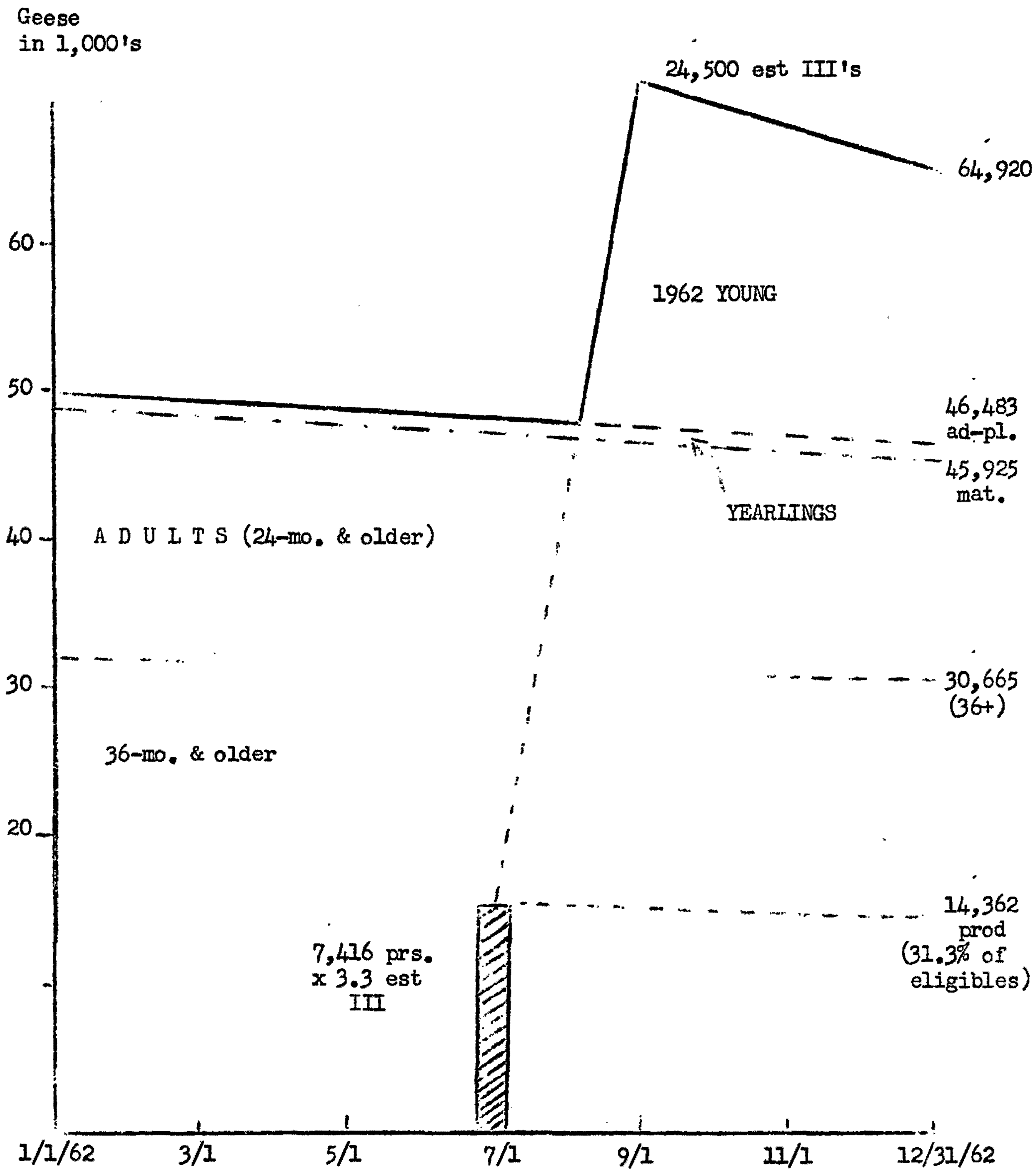
*NOTE, scale reduced from previous reports

Single-adult families amounted to 25% of all fall 1962 snow families recorded in Texas, but represented only 13.5% of snow families in the Louisiana and Pacific counts (Table 2). NOTE: To compute number of one-adult families from data such as is presented in Tables 1 through 4, multiply the "Number of Families" (1st column) by 2, then subtract the "Number of Adults" tallied in these families (Column 2); the difference represents the number of families having only one surviving parent.

The relatively high percentage of single-adult families in Texas counts suggests rather heavy losses among Central Flyway snows. Since this same percentage was noted in our earliest fall 1962 counts, made during the period geese were arriving at their winter quarters in Texas and before the hunting season opened there, the mortality must have taken place either during fall migration, or on the nesting grounds or premigration staging areas. While the loss might seem heavy, it is neither unusual nor serious. In our historical records, Texas winter appraisals almost always show single-adult families ranging from 20 to 30% of all snow and blue families wintering there. While consistently higher than the corresponding figure for Louisiana or Pacific Flyway geese, this evidence of mortality probably reflects only the already well-known fact that fall-migrant snows (and blues) that come down the Great Plains route stop more often and dawdle longer than do birds that come down east or west of that route.

Speaking of "dawdling", the fall 1962 south-bound flite of lesser snows was an almost interminable affair. Some birds lingered in the Northern Plains until mid-November (as already described for blues in Section I). A number of snows and blues seem not to have reached the Gulf winter quarters at all, for 60,000 were recorded from non-coastal States like Illinois, Missouri, and Oklahoma during the January 1963 midwinter inventory. While these dawdlers may well have sustained more hunting pressure than usual, their retarded fall migration would not have brought about the evidences we have cited of less-than-capacity reproduction of snows in 1962. Quite the contrary, it may have been the latter that brought about the former. Late hatches among snows and blues usually herald a lingering and much-interrupted fall migration (personal communication, F. G. Cooch, CWS). There is abundant evidence that the 1962 snow goose hatch was late (or interrupted), as already described for the blue (Section I), and the retarded migration that could be expected as a normal consequence would have been greatly encouraged by mild fall weather in the Northern Plains.

FIGURE C. ATLANTIC SNOWS: 1962 Population Plot



Evidences of 1962 productivity were so uniform among the various wintering population of lesser snows that their direct totals (Table 2) are acceptable for analysis without weighting. This agreement, despite the variety of nesting conditions that must have prevailed in 1962 over the vast breeding range of the snow, invites a bit of philosophical speculation. In last year's (1961) nesting, it would seem as though environmental adversities had somewhat the upper hand, although the snow by virtue of its splendid nesting geography had some nesting colonies in regions not reached by poor weather, and so the species was able to "muddle through" that year. But in the 1962 nesting there is hint that birds prevailed over the environmental factor(s), perhaps because their biotic potential, stripped of "fat" and otherwise strengthened by the 1961 brush with adversity made them better able to cope with environmental difficulties. It is true that mature and experienced breeders available for the 1962 nesting stemmed in large part from the propitious nesting conditions of 1960 and '59; but their 1962 young, originating as they have under auspices that were scarcely hospitable, will probably grow up thinking that adversity is a normal state of affairs. In times of future stress such "odd-balls" may have great survival value for species.

SECTION III, THE ATLANTIC SNOW GEESE IN 1962*

The Atlantic snow geese (mostly "greater snows") went into the 1962 nesting in a very strong position. Of their number 98.8% were birds 24 months of age or older in June 1962, so virtually the entire population should have been eligible to nest. Two-thirds of these geese were over 36 months of age at that time and presumed to be experienced nesters.

Yet a mere third (31.3%) of adult snows that returned to Atlantic Coast winter-quarters in fall 1962 were accompanied by young. These productive adults amounted to less than half (45%) of the older (36+ mo.) experienced birds. The broods they brought south averaged 2.2 young at midwinter; this figure is higher than the average brood recorded for lesser snows and blues in 1962 but must be considered somewhat low for the lightly hunted Atlantic snow (Table 7).

Here again is a picture of reproductive success that was adequate, but not particularly outstanding in the light of a temporarily great potential. It would be unrealistic to bewail that portion of the potential that remained unexploited in the Atlantic snows in 1962; the function of this and any other population is survival, not everlasting and ever-increasing abundance. Perhaps, in a biological sense, the full potential was "exploited". Its full expenditure may have been required so as to accomplish the reproduction needed for maintenance of this population, in the face of 1962 environmental conditions that were not particularly propitious.

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*Surveys by C. E. Addy and cooperators.

There is sometimes a tendency in waterfowl studies to become preoccupied with environmental factors "E" in the life-equation P/E; it is well to remember that biotic potential "P" in this equation is not immutable, and that changes in its quality may be more important to survival than changes in its numerical strength. Or to put it more succintly, the study of waterfowl is the study of birds, as well as of aquatic landscaping and arithmetic.

SECTION IV, BLUE-SNOW MIXTURES*

Where blue and snow geese occur in the same region, "mixed families" and other apparently inseparable groups may be seen wherein some birds are blue geese and some snows. The blue-snow complex is a fascinating subject, one that invites detailed study in the field as well as in the genetics lab. But the mixtures also pose a very immediate problem to the conduct of routine appraisals of annual productivity.

It had been the practice in winter surveys to emphasize recording of the all-snow and all-blue groups; mixed families and other mixed groups were tallied only when circumstances were favorable. "Circumstances" in the early years of this work might find a lone observer trying to scan the entire continental population of species; this worker had to make all observations and simultaneously record them (whenever his clip-board floated within reach). He usually had all he could to do to get records of pure snow or blue groups. It was obvious that a substantial number of wintering blues and snows were involved in the mixtures, yet such records were usually too fragmentary each winter to be considered in determining annual productivity, and so they were set aside for special study.

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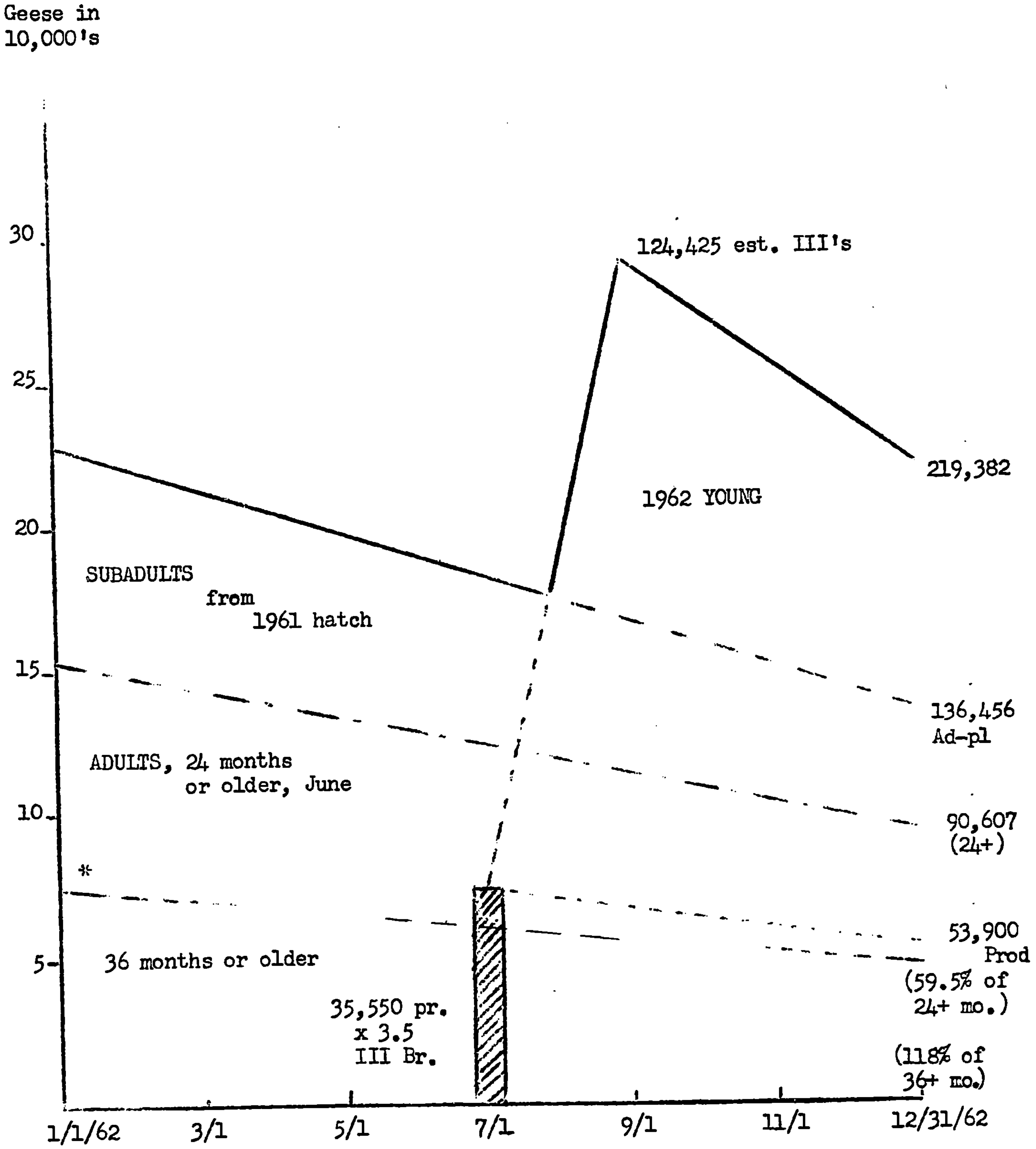
*In these appraisals, Blue and Lesser Snow geese are discussed as though they were separate species (as set forth in AOU Checklist, 5th ed.). This is done only for convenience; the treatment of the blue as a color-mutant of the snow (See J. Delacour, Waterfowl of the World, V. 1) for history of taxonomy, is the more realistic way of treating this group of birds.

FIGURE D. WHITE-FRONTED GOOSE: 1962 Population Plot



* (located from Gulf data only)

Sooner or later we had to learn whether this high-handed casting aside of data might compromise our regular records for blue and snow geese. As more observers engaged in these surveys, better records of mixed groups could be maintained. The latter eventually gave assurance that the problem of mixtures was not cause for great concern, yet was worthy of some additional scrutiny for research as well as procedural reasons. In the fall of 1962, when portable recording equipment was available, the regular appraisals were expanded in some areas so as to include special counts* of mixtures. These counts, presented in Table 10, sought to tally all blue-snow mixtures area by area, in their true numerical position relative to pure blue and pure snow groupings in Louisiana and parts of Texas.

In Table 11, a general summary of these records suggests that pure and mixed records can be handled separately or together, without making very much difference either way. The relatively low "percent productive adults" figure for mixtures is to be expected, for it derives in large part from "mixed pairs" and so does not consider many groups of three or more adults. The large "average brood" in mixed records has been discussed in our 1960 report; for obvious reasons this figure cannot include many blue parent or snow parent families that originally may have had mixed young, but at the time of observation had only one surviving youngster of the same color phase as its parents. NOTE: This Table 11 is not for use in detailed study of mixtures, for it includes too few snows to give a well balanced picture of the geese of the western Gulf region; Table 10 is more suitable for area-by-area examination of the blue-snow complex.)

SECTION V, THE WHITEFRONT IN 1962**

For the second consecutive year we have been able to construct a rather comprehansive picture of annual increment and mortality in the white-fronted goose. Our knowledge of this species is growing, thanks to cooperative studies by the Canadian Wildlife Service (Alex Dzubin), and the Central Flyway Council Technical Committee (George Schildman, Harvey Miller, Merrill Hammond, and Charles Stutzenbaker). But we lack, for the whitefront, the great backlog of historical information that is now available for some other geese, and that has been of such immense value in converting raw field data into a semblance of real understanding of status, welfare, and innermost workings of populations. In examining whitefront data, we have drawn upon experience with blues and snows; conclusions reached by this route are to be considered tentative until corroborated by more specific information.

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*By J. Lynch, Ralph Andrews and Jake Valentine, B SFW.

**Pacific surveys by G. Hortin Jensen and cooperators; Central Flyway by Chas. Stutzenbaker and Texas Game & Fish Comm. personnel; Mississippi Flyway by J. Lynch, R. Andrews, and C. R. Lynch.

The question of breeding age in the whitefront, one of those vexing "minor details" that assumes paramount importance when productivity data for a species are to be evaluated, now nears acceptable solution. Figure D of this report, 1962 Population Plot for the whitefront, segregates* the end-of-the-year population into young (6 months old on 12/31/62), subadults (18 months), 30-month birds (24 months in midsummer 1962), and whitefronts older than 42 months (36 months or older in midsummer, 1962). Also indicated for December 1962 is the number of adult whitefronts then accompanied by young (survey "field % of Productive adults"). It is immediately obvious that the 53,900 figure determined for Productive adults is greater than the total indicated whitefronts "36-months or older".

This implication that birds younger than 36 months of age nested in midsummer 1962, is presented more dramatically (if less precisely) in the central portion of the population plot. The vertical column (cross-hatched) at the July 1 point is intercepted by a red-dashed line through its upper part. The red line signifies the probable upper level of birds 36 months of age and older at midsummer; even if all of the latter nested successfully in 1962, they could not account for the total number of productive adults in our appraisals, nor for the total number of young present in December 1962, unless helped by a substantial number (18%) of breeders that were less than 36 months old. If, as is more likely, only some of geese 36 months or older were productive, then a correspondingly greater number of younger geese must have nested in 1962. And 1962, it might be pointed out, was not an unusually productive year for these geese (See historical Tables 5 through 8).

This evidence of whitefronts nesting at age 24 months, while striking, should still be accepted as "not quite conclusive". The January 1, 1962 point on the line separating the 24-month old whitefronts from the 36-month or older birds has been located on Figure D using only Gulf data from the fall of 1960. We did not have a full picture of 1960 productivity among whitefronts in the Pacivic Flyway, although the information we do have (see Leon Littlefield's Sacramento records and M. C. Hammond's Souris counts in 1960 report) give assurance that most whitefronts that fall were probably as productive as those we appraised in the Gulf region.

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*1960 ratio of 1st-winter young to older birds is considered equivalent to Dec. 1961 ratio of 18-mo. to older birds, and consequently equals December 1962 ratio of 30-mo. to older birds.

Even without benefit of these evidences, the gross aspects of whitefront annual mortality and increment strongly suggest that many (if not all) whitefronts are sexually mature at 24 months, and will nest at that age if environmental conditions are favorable. Otherwise the species could not make good its vital statistics. The life expectation of the average whitefront (from birth), probably is not over 5 years (and from the looks of our population plots may not be much more than 4 years); such a species could not afford to have its breeders use up 3 full years of that life span in the process of getting ready to nest. Our appraisals of 1963 productivity should clear up this matter for once and for all.

The information produced by our most recent appraisals of productivity (Tables 4 and 8, and Figure D) suggests that the whitefront's 1962 nesting was eminently satisfactory, for it produced enough young to compensate for all calendar year losses. But it was not as productive as it might have been. Pacific wintering birds had broods that averaged 2.5 young, but the average brood figure for fall 1962 continental whitefronts was pulled down somewhat (although not so greatly as is literally implied by our direct addition of unweighted brood data) by smaller families among the Great Plains birds that wintered in Texas and Louisiana. Adults accompanied by young amounted to 39% of all adult-plumaged birds; since one-third of the latter should have been subadults from the 1961 hatch, the 1962 percentage of true adults productive would be 59.3% (Table 8, where 24+ month geese are assumed to be mature).

This brings up an interesting situation. The great similarity in most of the fall 1962 data from the Pacific, Central and the Mississippi Flyways suggests at first glance a certain uniformity in whitefront nesting conditions in midsummer 1962. But the same set of environmental conditions seldom prevails across the vast amount of real estate occupied by these nesting geese, except in those rare summers when weather is uniformly very good or universally very bad. In the summer of 1962, nest success among whitefronts, and for that matter all the other Arctic-nesting waterfowl for which we have records, was a remarkably consistent "middlin' fair". Was the whitefront's biotic potential so toughened by the relatively poor 1961 nesting that it was able to override varied environmental considerations in the 1962 nesting? Pure speculation, of course, but in the direction of achieving better understanding of the biology (as well as the arithmetic) of this remarkable bird.

SECTION VI, APPRAISAL OF PRODUCTIVITY IN CANADA GEESE VIA AVERAGE GROUP COUNTS

Young canadas do not have distinctive first-winter plumage, and so cannot be segregated readily from older birds by our winter field surveys. Yet the young do remain with parents as "family groups" all winter, and these groups are generally larger than yearling bands, mated pairs, and other durable social or functional groupings. If there are many family groups in a fall population of canadas, the "average group" will be large. Fall group size in all geese seems to vary directly with the percent young in fall flocks (see annual reports 1959-61).

In the fall of 1962, canada group-determinations were tried on an extensive scale. It was hoped that group counts would be made to cover all important segments of major populations and subpopulations, these to be simultaneous over large regions so as to "freeze in place" the overturn and other movement of migrants coming to and leaving each locality. The responses from some observers were not only gratifying, but greatly encouraging; while many important flocks remained unsampled, thus dashing hopes for any truly comprehensive picture of 1962 canada productivity, the data that were turned in were eminently credible, and in remarkable agreement with the firm data we have been getting for other species of geese.

Figure 9 shows the simple process by which the average-group records from many localities might be assembled and interpreted. Actual field surveys in any locality would first locate each important flock, estimate the total number of birds it contained (item 4), and then make tallies of all groups of 10 birds or less (singles included), at whatever times the small groups were most conspicuous in that flock. The number of birds in such records divided by the number of groups they represented (item 1) produces an average group (item 2) for that flock. This average group is converted to a % young figure (item 3) via a chart similar to Figure G in our 1961 Report. Since several different flocks may be found in a locality, and these may show disparate evidences of productivity, each flock is segregated into its probable number of young and older birds (item 4 x item 3 = item 6). Direct addition of these "indices" will then give a balanced area (or regional, subpopulation, flyway, etc.) total, from which regional percentages (7) may be derived.

NOTE: Delaware and Maryland surveys by E. B. Chamberlain and Ed Addy of BSFW, with Vern Stotts, Tony Florio and Bob Beck of Delaware Game and Fish Commission and BSFW Refuge personnel Nightingale and Rigby; North Carolina data from Otto Florschutz; Horicon NWR counts by W. D. Carter and staff; Rochester (Minn.) canada counts from R. L. Jessen; Small canada info from Alex Dzubin (CWS), Jack Grieb (Colorado), R. E. McWhorter (Sand Lake NWR), and Harvey Nelson (BSFW).

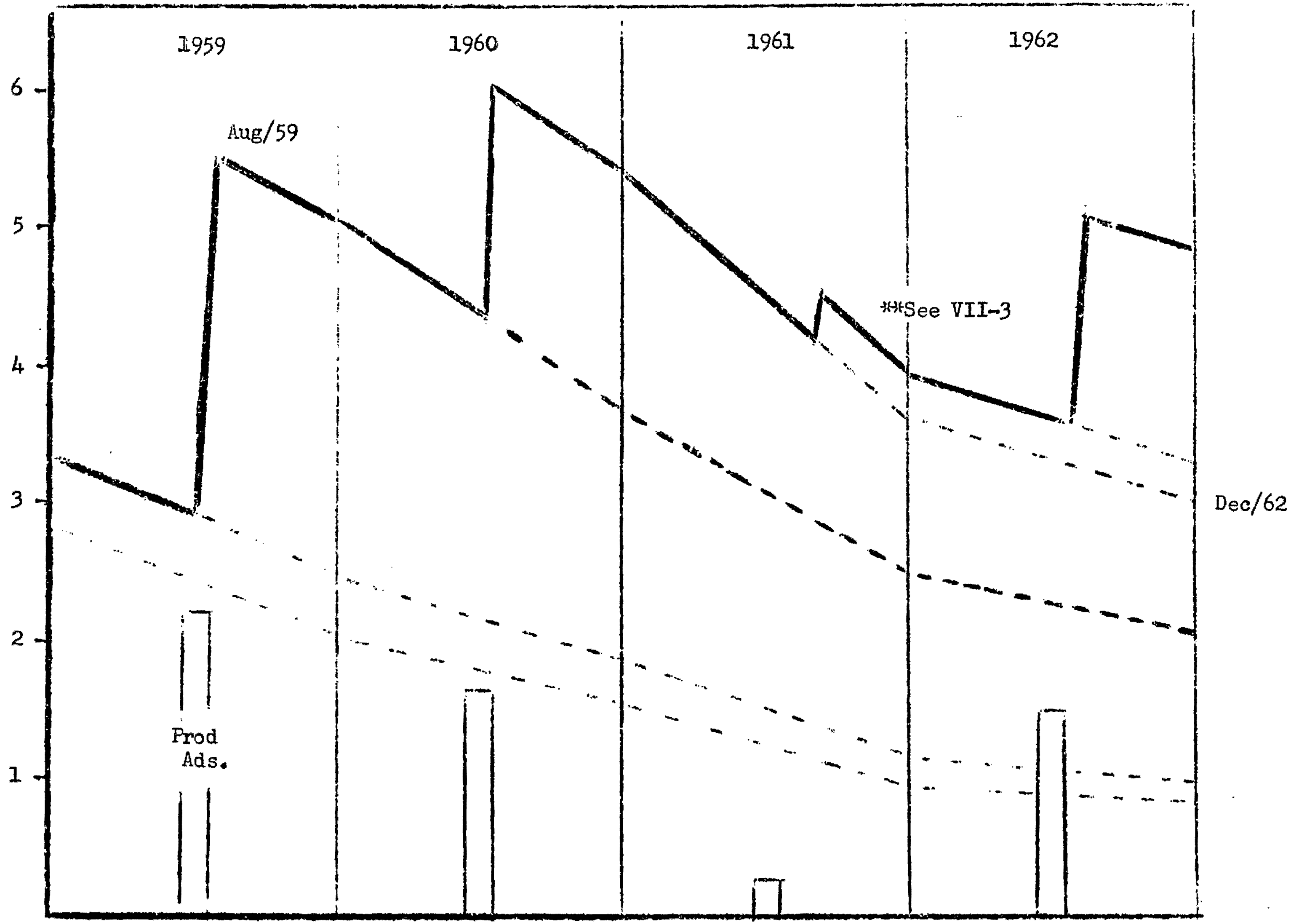
SECTION VII. OTHER APPRAISALS

1. Whistling Swans. Bob Smith (Migratory Birds Population Station) reports that swan age-counts, from air photos made in January 1963 on Chesapeake Bay, showed 15.9% young in a total of 3815 whistling swans. Merrill Hammond's Souris NWR fall 1962 swan counts indicate an average of 2.3 cygnets per family (in 120 fall families), and show that 10.6% of 2300 fall-migrant swans were young. March 1963 counts in Ohio by Karl Bednarik (letter of 3/29/63) showed 17.55% of 3,122 spring-migrant swans to be young from the 1962 hatch. Last year Atlantic coast swans showed 15% young, Souris fall figure was 8%, and Ohio spring figure was 11.4% young, so the new percentages suggest that the swan had slightly better reproductive success in the 1962 nesting than in 1961. Unfortunately we still do not know how to interpret these swan figures, and won't until we learn more about breeding age in the species. If the whistling swan does not attain sexual maturity until 5 full years of age (and there are some who think this is so), a fall figure of 10-15% young would represent splendid nesting success. If, at another and perhaps equally unlikely extreme, swans mature and nest at age 24 months, the same fall age-ratio would be very poor. The breeding-age question can be solved, given appropriate data, by the expedient described in the Whitefront Section V.

2. The Ross Goose. Alex Dzubin, Canadian Wildlife Service, reports (letter of 12/11/62) that the 1962 Ross goose nesting seems to have been late but quite good. He notes that most young Ross caught in early September 1962 had dark bills that did not change to pink until the first week in October, whereas in previous years most young Ross already had pink bills early in September. His field counts indicate that 47% of the 11,700 Ross' in Saskatchewan during September and October were young of the year, and over 2/3 of 732 Ross geese handled in the course of banding operations were young. But his average brood figure of 2.26 is low for an early-fall goose family, and is of itself suggestive of a late 1962 hatch among Ross geese.

3. Using Appraisal Data to Monitor Credibility of Total Counts. Most everybody grumbles at one time or other about reliability of the midwinter inventory of waterfowl. But, like the weather, this January total count is a subject "nobody does much about". In Figure E, by way of adding some light to a disputation already abundantly supplied with smoke and heat, we have employed winter appraisal data to examine the credibility (not necessarily the absolute accuracy) of inventory figures for the blue goose. January counts for this population are plotted in for each of the years 1959 through 62. Then this "total population index" for each year is segregated into its probable age-cohorts by application of productivity data from Table 5. When plotted or computed points are connected through the intervening years (by dashed lines in Figure E), the figure becomes a series of straight-line "survival curves" that start with birds 6-months old (to by-pass variable mortality that may be expected among younger birds in the

FIGURE E. USE OF WINTER APPRAISAL DATA TO MONITOR CREDIBILITY OF MIDWINTER INVENTORIES



period August through December each year). We note a suspicious dip in January 1962 levels, in the otherwise rather smooth flow of these lines. Examining this dip more closely, we see that a very precipitate drop in the blue goose population is indicated by the January 1962 inventory, which would imply literally that calendar year mortality for 1961 was extraordinary despite the relative scarcity of vulnerable young in the fall population that year. The possibility does exist that nesting conditions were so bad in the summer of 1961 as to destroy numbers of breeding adults. But this remote possibility becomes even more remote when the 1962 history of "lesser mortality under conditions of greater vulnerability" (late hatch, non-propitious nesting conditions, interrupted fall migration, etc.) is examined. There is strong suggestion here that the January 1962 blue goose count was low by 60,000 to perhaps 75,000 birds. This possibility should be held in abeyance, however, until another year's history demonstrates that the January 1963 count is within the range of error to be expected in total counts of this nature. The same comments and cautions would hold true for the 1962 histories of lesser snows (Figure B) and Atlantic Snows (Figure C). Meanwhile we might point out that total counts of goose populations are nothing to be ashamed of, for their history in terms of credibility is remarkably good. Lapses such as the ones discussed above can be expected, and can be detected within certain limits. They usually prove to be the result not of inaccurate estimates of numbers of birds, but rather of failure to find important wintering segments of populations. Such failure should not occasion surprise, when it is remembered that some years the January census devotes only a day or two out of a 5-month winter period to looking for these geese, which may allow only brief minutes for searches of some important wintering regions.

SECTION VIII. WINTERING NOTES

Are snow and blue geese in the process of abandoning their traditional wintering grounds? This question comes up every time their fall migration is retarded as it was in 1962. Snows and blues are eminently capable of developing new traditions; any of their young that are encouraged to winter in regions north of traditional flite termini could in time stop off with their young in the "new winter quarters", just as seems to have happened when many Canada geese developed the tradition of wintering in more northerly regions. Yet snows and blues are different from the Canada geese in that the former can be gotten to <u>tolerate</u> human companionship, without <u>accepting</u> it with the enthusiasm often displayed by the latter.

Occasional years of slow and much-interrupted fall migration are quite normal for blues and snows. Such migrations seem to be associated with, and probably are a consequence of, late hatches on the breeding grounds. Stopover birds are encouraged to dawdle by mild fall weather and by protection. Yet the fall migration the next normal year always seems to sweep south more or less on schedule. The odds still favor retention of this tradition, altho only time can tell whether blues and snows will respond to the sort of 'menagement' (cf. menagerie) that has proved so distressingly efficacious for the Canadas.

Speaking of new traditions, blues and snows threatened in the fall of 1962 to abandon altogether the marshes of southwestern Louisiana. During the past two decades these geese have been frequenting, in ever-increasing numbers, the rice fields rather than the marshes of this portion of the Western Gulf region. First they made feeding forays into agricultural lands, returning to roost in the coastal marshes in the interim. Then some flocks became full-time winter residents in the rice fields. In the fall of 1962, incoming migrant blues and snows dropped directly into the ricefields of southwestern Louisiana instead of proceeding on to the coast. They were still in these agricultural lands at midwinter, and many birds never went to the coast at all.

The western Gulf region was quite dry in late summer of 1962. Moderate rains that visited this region in early fall had barely moistened the coastal marshes when fall-migrant geese arrived. The same few inches of rainfall had a profound effect in the rice fields, leaving sheet-water where soils that had been irrigated all summer were still saturated. Our local goose-experts, once they saw this fall picture from the air (the way it looked to geese), did not bother to inquire further as to "probable reasons for recent changes" in wintering habits of these birds. Although we "experts" are left with the sticky task of "evaluating", at this late date, the "splendid goose habitats of the coastal marshes" that still seem to have everything we think geese need (only the geese stubbornly refuse to share our feelings in this regard).

TABLE 1, BLUE GOOSE, 1962 FIELD DATA

Localities & Dates	In Families # Fam.	In Families Ads.	In Families Imm.	Other Ads.	Other Imm.	Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	3/ Average Brood
Southeast La.	1282	2397	2604	2811 / 1404	224 / 156	5208	2828	8036 / 2842	35.2	46.0	2.0
E. Vermilion, La.	926	1767	1844	2267 / 1022	76 / 64	4034	1920	5954 / 2012	32.2	43.8	1.9
Gueydan, La.	2116	3937	4033	4734 / 2142	214 / 157	8671	4247	12918 / 4415	32.9	45.4	1.9
East Cameron, La.	788	1452	1465	2097 / 959	105 / 86	3549	1570	5119 / 1833	30.7	40.9	1.8
West Cameron, La.	307	592	578	879 / 417	25 / 17	1471	603	2074 / 741	29.1	40.2	1.9
East Texas (Dec)	104	195	182	434 / 224	10 / 9	629	192	821 / 337	23.4	31.0	1.7
Lower Texas	318	542	523	1229 / 704	107 / 92	1771	630	2401 / 1114	26.2	30.6	1.6
GRAND TOTAL	5841	10882	11229	14451 / 6872	761 / 581	25333	11990	37323 / 13294	32.1	42.9	1.9

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

TABLE 2, LESSER (WESTERN) SNOW GOOSE, 1962 FIELD DATA

Localities & Dates	In Families: # Fam.	In Families: Ads.	In Families: Imm.	Other: Ads.	Other: Imm.	Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
Pacific Flyw.	751	1400	1578	2608	95	4008	1673	5681	29.5	34.9	2.1
Lower Texas	1241	2133	2261	3703/1706	225/188	5836	2486	8322/3135	29.9	36.5	1.88
East Texas	248	467	506	953/462	45/32	1420	551	1971/742	27.9	32.9	2.0
Texas Totals	1489	2600	2767	4656/2168	270/220	7256	3037	10293/3877	29.5	35.8	1.9
W. Cameron, La.	58	113	113	289/153	--	402	113	515/211	21.9	28.1	1.9
E. Cameron, La.	120	226	257	623/361	31/27	849	288	1137/508	25.3	26.6	2.1
Gueydan, La.	133	248	264	435/256	31/28	683	295	978/417	30.2	36.3	2.0
E. Vermilion, La.	36	61	60	140/92	13/13	201	73	274/141	26.6	20.1	1.7
S.E. La.	8	14	23	119/95	16/16	133	39	172/119	22.7	10.5	2.9
Louisiana Totals	355	662	717	1606/957	91/84	2268	808	3076/1396	26.3	29.2	2.0
Grand Totals	2595	4662	5062	8870	456	13532	5518	19050	29.0	34.5	1.95

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

TABLE 3, ATLANTIC SNOW GEESE, 1962 FIELD DATA

Localities & Dates	Est. Birds in Vicinity	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
		# Fam.	Ads.	Imm.	Ads.	Imm.						
Mackay Is.	55,000	242	455	523	$\frac{877}{394}$	$\frac{51}{23}$	1332	574	$\frac{1906}{659}$	30.1	34.2	2.16
Bodie Is.	10,000	94	178	231	$\frac{538}{255}$	$\frac{9}{7}$	716	240	$\frac{956}{356}$	25.1	24.9	2.5
GRAND TOTAL		336	633	754	$\frac{1415}{649}$	$\frac{60}{30}$	2048	814	$\frac{2862}{1015}$	28.4	30.9	2.24

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

TABLE 4. WHITEFRONT, 1962 FIELD DATA

Localities & Dates	In Families			Other		Total Ads.	Total Imm.	Total Birds	% 1/ Imm.	% 2/ Prod.	Average 3/ Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
Pacific	810	1414	2038	2173	251	3587	2289	5876	38.9	39.4	2.5
Miss-Centr.	679	1163	1412	1769	267	2932	1679	4611	36.4	39.7	2.1
Cont. Tot. (Direct)	1489	2577	3450	3942	518	6519	3968	10487	37.8	39.5	2.3

1/ $\frac{\text{Total young}}{\text{Total birds}}$ = % Imm.

2/ $\frac{\text{\# Adults having young}}{\text{Total in adult Plumage}}$ = % Prod. (See Pop. Plot)

3/ $\frac{\text{\# Young "in Fam."}}{\text{\# of Fam.}}$

Table 5. Historical Record, Blue Goose Annual Productivity

(from wintering-grounds appraisals)

YEAR (Fall of:)	Percent Young	Ad:Subad:Young (in thous.)	Average Brood (Fall)	Field* % Prod.	True** % Prod.
1949	47.6	90:108:180	2.1	46.4	100.0
1950	35.5	111:101:117	2.1	37.3	71.2
1951	11.2	177: 97: 35	1.6	13.2	16.0
1952	48.5	179: 23:190	2.4	66.7	75.0
1953	38.9	157:148:195	2.2	51.0	99.0
1954	1.8	200:134: 6	1.6	1.6	2.7
1955	54.9	200: 4:247	2.7	75.7	77.0
1956	31.8	117:143:121	2.1	30.7	68.0
1957	46.1	156: 73:196	2.3	62.5	91.6
1958	16.3	154:129: 55	1.6	19.7	36.0
1959	51.4	202: 39:255	2.5	75.0	89.6
1960	32.2	186:175:171	2.2	38.3	75.0
1961	7.0	243:116: 27	1.6	7.7	11.4
1962	32.1	299: 22:152	1.9	42.9	46.1

* % of geese in adult plumage (including subadults) that brought young to the wintering-grounds.

** Probable % of mature adults (22 months of age or older) accompanied by broods in fall.

Table 6. Historical Record, Lesser Snow Goose

(Gulf, Pacific, & Continental Productivity, from Winter Surveys)

YEAR (Fall of:)	Dec. Pop.	% Young	Ad:Subad:Imm.	Average Brood	Field % Prod.	% Prod (of Ads 24 mths or older
1948 (Gulf Only)		46.2		1.9	83.3	
1949 "		47.9		2.1	70.2	
1950 "	403,000	40.5		2.3	43.2	
1951 "	225,000	11.3		1.5	14.3	
1952 "	332,000	47.9		2.2	73.4	
1953 "	471,000	49.1		2.1	77.8	
1954 "	323,000	26.9		1.8	34.0	
1955 "	479,000	42.2	(No Texas Data)	2.6	44.3	
1956 Gulf	290,000	40.6		1.9	52.0	
Pac.	351,000	25.5		2.3	17.3	
Cont.	641,000	32.4	250:183:208	2.1	31.1	53.8
1957 Gulf	300,000	39.9		1.9	53.1	
Pac.	317,000	32.8		2.2	33.1	
Cont.	617,000	36.3	266:127:224	2.0	42.2	62.3
1958 Gulf	212,500	29.2		1.6	37.1	
Pac.	388,100	20.1		1.9	19.7	
Cont.	600,600	23.3	293:168:140	1.8	25.4	40.0
1959 Gulf	297,173	49.7		2.4	70.1	
Pac.	360,000	38.2		2.3	49.3	
Cont.	657,173	43.7	284: 86:287	2.3	58.4	75.0
1960 Gulf	265,400	41.3		2.0	50.2	
Pac.	461,000	38.8		2.3	48.8	
Cont.	726,400	39.8	246:191:289	2.3	49.3	87.5
1961 Gulf	191,200	17.9		1.7	18.1	
Pac.	541,000	20.6		1.8	25.1	
Cont.	732,200	19.9	353:233:146	1.8	23.1	38.3
1962 Gulf	374,539	28.8		1.9	34.3	
Pac.	482,761	29.5		1.9	34.9	
Cont.	857,300	29.0	488:121:249	1.9	34.5	43.1

Table 7. Historical Record, Atlantic Snow Geese

(from winter appraisals)

YEAR (Fall of:)	Dec. Pop.	% Young	Ad:Subad: Imm.	Average Brood	Field % Prod.	True % Prod. (of ads. 24 mths. or older
1956	34,788	33.8	(22.9) :11.8	2.99	43.6	
*1957	39,950	34.4	17.3: 8.9:13.7	2.34	38.7	58.5
*1958	48,249	3.1	**30.7:16.1: 1.5	2.22	2.6	2.6
*1959	52,929	42.7	29.4: 0.9:22.6	2.63	51.3	52.9
1960	67,140	34.1	25.3:18.9.22.9	2.30	40.3	70.3
1961	49,700	1.2	32.4:16.7: 0.6	1.53	1.3	1.9
1962	64,920	28.4	45.9: 0.5:18.4	2.24	30.9	31.3

* Over 80% of winter population photographed.

** Anomaly, may represent variable infiltration of western race (see discussion).

*** Percent of fully-mature (24 month-old and older) birds bringing young south.

Table 8. Historical Record, White-fronted Goose

Year (Fall of & Data Block	December Pop.	% Young	Ad:Subad:Young (In Thous)	Aver. Brood	Field % Prod.	True % Prod.
1956, Gulf		33.8		1.8	49.8	
Cont.	133,000					
1957, Gulf		46.3		1.8	62.1	
Cont.	165,300					
1958, Gulf		42.8		2.3	53.5	
Cont.	193,900					
1959, Gulf		51.6		2.6	62.1	
Cont.	215,200					
1960, Gulf		50.4		2.8	56.1	
Cont.	228,000					
*1961, Gulf	33,000	16.8		2.0	15.7	
Pacific	193,300	36.5		2.3	37.0	
Cont.	226,300	33.6	74.5:75.7:76.1	2.3	33.1	66.7
1962, Gulf	91,692	36.4		2.1	39.7	
Pac.	127,690	38.9		2.5	39.4	
Cont.	219,382	37.8	90.6:45.9:82.9	2.3	39.5	59.5**

*First truly continental appraisal; see 1960 Report for reconstruction of possible continental picture from Gulf Coast appraisal data.

**% of birds 24-months of age or older in June 1962.

TABLE 9. SAMPLE ASSEMBLY, CANADA AVERAGE GROUP RECORDS

See text, Section VI for explanation

LOCALITY	1/ # Birds / # Groups	2/ Average Group	3/ Equival. % Young	4/ Population in area Sampled	Calculated: 5/ 6/ Young	7/ % Young
Delaware (11/6-8/62)	1108/369	3.00	22.5	4,500	1,013	
	2598/775	3.35	31.0	19,000	5,890	
				23,500	6,903	= 29.37
Maryland (11/6)	1755/568	3.09	24.7	5,500	1,359	
	1162/387	3.00	22.5	10,000	2,250	
				15,500	3,609	= 23.28
N. Carolina (11/6-10)	1989/679	2.93	21.0	6,000	1,260	
	1563/477	3.28	29.3	5,000	1,465	
	625/219	2.85	19.0	3,000	570	
				14,000	3,295	= 23.53
Horicon, Wisc. (9/29)	4615/1507	3.06	24.1	22,200	5,350	= 24.09
Rochester, Minn. (12/19)	414/101	4.1	49.0	?	-	= 49.[illegible]
Sask. (Smaller Can.)	680/168	4.05	47.8	2,500	1,195	
	242/57	4.25	52.5	2,000	1,050	
	421/101	4.17	50.2	1,200	602	
				5,700	2,847	= 49.95
Sand L. (10/25-11/1)	650/190	3.42	32.7	1,500	491	= 32.73
Two Buttes (11/29 - 12/8)	245/95	2.58	12.9	5,000	645	
	427/126	3.39	32.1	5,000	1,605	
	171/51	3.35	31.0	6,800	2,108	
				16,800	4,358	= 25.94

Table 10, Fall 1962 Blue-Snow Mixtures (and accompanying Normal groups)

(arranged from East to West, Gulf records)

Locality & Data #	Normal Groups: Tot. Birds	Normal Groups: # Famil Incl.	Associated Mixed families and Non-Prod. Mixed adults (prsubad): Parents Blue: Ads/fam.	Parents Blue: Young	Parents Snow: Ads/fam.	Parents Snow: Young	Parents Mixed: Ads/fam.	Parents Mixed: Young	No parents: Young	Mixed: Ads (no yg.)
#22 SE La.	B- 2331 S- 34	390 1	B 42/23	B - S 50 + 23	S 2/1	B - S 1 + 4	B + S 22/11	B - S 15 + 9	B - S 0 - 0	B - S 29 - 29
#26 Delta, La.	B- 3085 S- 63	480 3	40/26	38 + 26	0/0	0 + 0	34/17	31 + 7	3 - 2 2	40 - 40
#17a Esther, La.	B- 1772 S- 66	284 4	20/10	9 + 12	0/0	0 + 0	14/7	9 + 5	0 - 0	36 + 36
#17b Esther	B- 1319 S- 43	200 3	4/2	1 + 4	0/0	0 + 0	24/12	15 + 10	0 - 0	25 + 25
#12 Gueydan, La.	B- 2796 S- 143	495 23	34/17	27 + 21	2/1	1 + 3	34/17	30 + 9	0 - 0	57 + 57
#13 Gueydan	B- 2874 S- 167	523 21	46/24	39 + 27	2/1	1 + 1	56/28	34 + 16	5 + 5 5	65 + 65
#20 Gueydan	B- 2336 S- 166	368 18	25/13	19 + 14	4/2	2 + 2	36/18	25 + 8	2 + 2 2	43 + 43
#14 Klondike	B- 902 S- 130	150 23	8/4	8 + 4	0/0	0 + 0	10/5	8 + 1	0 + 0	18 + 18
#27 Thornwell	B- 2996 S- 368	487 39	40/21	31 + 22	11/7	12 + 5	84/42	60 + 25	4 + 4 4	82 + 82

Table 10 Continued

#16 Holmw.	B- 2771 S- 702	396 70	B 14/7	B – S 7 + 8	S 5/3	B – S 4 + 3	B + S 44/22	B – S 22 + 20	B – S $\frac{4 + 3}{3}$	B – S 118+118
#31 Sabine	B- 941 S- 161	40 3	12/6	9 + 6	0/0	0 + 0	10/5	4 + 7	0 + 0	57+ 57
#32 Gum C.	B- 662 S- 255	88 29	14/7	10 + 7	2/1	1 + 2	26/13	12 + 6	$\frac{2 + 1}{1}$	35 +35
#38 McFaddin	B- 690 S- 1177	87 122	14/7	9 + 10	8/4	4 + 7	38/19	11 + 16	$\frac{1 + 1}{1}$	71 + 71
#6 Lissie	B- 47 S- 486	3 66	0/0	0 + 0	2/1	1 + 4	10/5	7 + 3	0 + 0	25 + 25
#11 Lissie	B- 427 S- 2260	38 313	0/0	0 + 0	22/11	11 + 24	18/9	10 + 10	$\frac{2 + 2}{2}$	112 + 112
GRAND TOTALS	B- 25,949 S- 6,221	4029 738	313/167	257 + 184	60/32	38 + 55	460/230	293 +152	$\frac{23 + 20}{20}$	813 + 813

Table 11, Blue-Snow Complex, Fall 1962

(Productivity in pure-vs-mixed groups)

	In Families			Other		Total Ads.	Total Imm.	Total Birds	% Imm.	% Prod.	Average Brood
	# Fam.	Ads.	Imm.	Ads.	Imm.						
Pure Blue*	4029	7571	7783	10080	515	17651	8298	25949	31.98	42.89	1.93
Pure Snow*	738	1354	1446	3306	118	4660	1564	6224	25.13	29.05	1.96
Totals B & S w/o Mixed	4767	8925	9229	13386	633	22311	9862	32173	30.65	40.00	1.94
Mixtures, B-S	429	833	979	1626	53	2459	1032	3491	29.56	33.87**	2.28***
Grand Totals Pure & Mixed Blue & Snow	5196	9758	10208	15012	686	24770	10894	35664	30.54	39.39	1.96

* Heavy on Blues, because of Louisiana counts
** Based on "mixed B-S pairs", and so includes no singles nor groups of 3 or more adults.
*** Possibility that some one-young families of BxB or SxS parentage excluded