

Nectarine Size Study

California Tree Fruit Agreement and University of California  
Report by Rene Guillou and Eugene Mayer  
February 1961

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In 1959 the California Tree Fruit Agreement, on behalf of the Nectarine Administrative Committee, requested the University of California to analyze size data collected by the Committee, with a view to devising size regulations. A report submitted in September 1959 suggested minimum net weights for cup-packed row sizes. The limited weighings of each size and variety did not show any significant differences between varieties. Nectarines packed in plastic trays ran lighter than those packed in paper cups, by around one pound per box. The range between lightest and heaviest boxes in each pack was from two to five pounds, however, indicating that elimination of the lighter plastic-tray boxes could make the two packs equivalent in weight.

Possible ring-size limits were also suggested, though the data for each size and variety were too limited for confident conclusions. In any case, the per cent of fruits passing a given ring is a poor size standard, because it takes no account of how much larger or smaller than the ring the fruits may be. Additional ring measurements in 1960 were too few to justify any further analysis of ring sizes.

Weights taken in 1960 are reasonably adequate for 14 of the 16 leading varieties and for 3 varieties of minor importance. Weights are inadequate or missing for 12 of the 28 varieties listed in the 1960 report of the Tree Fruit Agreement.

Weights by sizes, varieties, and packs are shown in tables 1 through 5, arranged for direct comparison between varieties and between cup pack and plastic tray pack. The same data are shown in figures 1 through 15, arranged for direct comparison between varieties only. Suggested minimum net weights per box are shown in table 6 and are also indicated in the other tables and on the figures. Corresponding weights per 100 nectarines, and number of nectarines in a 10-pound sample, are shown in table 7 and 8. These weights are estimated to accept the sizes of nectarines that were weighed in 1960, with a tolerance of 10 per cent of the containers in a lot allowed to be under minimum weight.

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It should be noted that if some lots have 10 per cent of the containers under a minimum, there will be other lots in which fewer or none of the containers will be under this minimum. Combined figures for a number of lots will, therefore, show considerably less than 10 per cent of the containers under such a minimum. Five per cent or less of all the containers weighed were under the minimums suggested here, which allows for some lots having had no containers under the minimum and others having had up to ten per cent under the minimum.

The additional weights taken in 1960, as compared with 1959, indicate probable differences between varieties. Actually the weights of different varieties were commonly taken in different packing houses. A variety that happened to be weighed at houses that put up a heavy pack might appear to be heavy, when it was really about average. Considering this situation, a simpler and perhaps adequate schedule of minimum required weights would be:

Size	80	88	96	108	4 x 4
Standard pack minimum, lb	19	18 1/2	17 1/2	17	26
Weights per 100 fruits, lb	24	21	18	16	15
Fruits in a 10-pound sample	42	48	55	64	68

All of the requirements suggested in this report are based on maintenance of sizes equal to those weighed in 1960. The effect of heavier requirements, if such are considered, can be seen by reference to the tables and charts.

Table-1 Numbers of Lugs by Net Weights

Variety	Numbers of Lugs										Plastic Trays				Numbers of Lugs	Sunrise
	Golden Grand	Gold King	Grandeur	Le Grand, Early	Le Grand Late	Red Grand	Star Grand	Star Grand II	Sun Grand, Early	Sun Grand	Gold King	Le Grand	Le Grand, Late	Red Grand		
Net wt. lbs.																
18 1/4										1/2						1
18 1/2																0
18 3/4																1
19																0
19 1/4	0			0	0	0			0	1		0	0			1
19 1/2	0			0					0	7		0	0			1
19 3/4	1			0					1	6		1	1			1
20	1			2												1
20 1/4	1	3	2	7	1	0	0	0	3	3	0	1	1	1		1
20 1/2	1	4	2	5	4	0	0	0	3	3	2	3	1	2		1
20 3/4	0	4	1	2	9	0	0	0	7	2	2	5	4	1		1
21	2	2	2	5	12	4	1	3	1	1	0	3	6	3		1
21 1/4	0	5	3	6	17	1	3	3	6	5	4	4	2	0		1
21 1/2	3	4	0	6	14	4	2	1	2	1	1	4	5	4		1
21 3/4	1	3	0	3	14	2	1	3	1	0	2	0	2	0		1
22	1	1	0	3	7	1	1	0	1	0	0	0	2	0		1
22 1/4	4	1	0	1	3	0	2	1	3	0	0	1	2	2		1
22 1/2	0	1	1	2	0	0	0	0	0	0	0	1	6	0		1
22 3/4	2	0	0	2	0	0	0	0	0	0	0	0	2	0		1
23	0	0	0	0	2	0	0	0	0	0	0	0	0	0		1
23 1/4	2															
23 1/2	1															
Total	20	28	11	44	83	12	10	11	28	39	11	23	34	13		7

Each weight includes boxes up to the next quarter pound heavier; for example, boxes 20 pounds or over but under 20 1/4 pounds are included as 20 pounds.

Table-2 Numbers of Lugs by Net Weights

Variety	Numbers of Lugs by Net Weights										Plastic Trays 38s				Numbers of Lugs
	Net wt. lbs.	Grandeur	Grand River	Le Grand, Early	Le Grand, Late	Princess	Red Grand	Star Grand	Sun Grand, Early	Sun Grand	Sunrise	Le Grand, Early	Le Grand, Late	Sun Grand, Early	
18		0	0	0	1	0	0	0	0	0	0	0	0	0	2
18 1/4		0	0	1	0	0	0	0	0	0	0	0	0	0	2
18 1/2		1	0	0	0	0	0	0	0	3	0	0	0	0	4
18 3/4		1	0	0	0	1	0	0	0	0	5	0	0	0	6
19		2	0	0	1	0	0	3	0	4	4	0	0	0	3
19 1/4		3	1	2	2	0	0	5	4	2	5	0	0	1	0
19 1/2		1	0	3	0	0	0	0	2	3	5	5	1	0	0
19 3/4		6	0	8	2	2	1	2	6	5	1	1	0	2	0
20		3	0	9	10	3	6	0	9	5	6	1	0	7	0
20 1/4		5	3	9	4	3	6	1	20	8	2	2	3	8	0
20 1/2		1	4	9	8	2	6	3	27	6	1	0	4	8	0
20 3/4		3	5	10	7	2	7	1	36	5	1	0	2	18	0
21		4	4	10	12	3	6	2	21	2	0	1	7	12	0
21 1/4		3	7	8	12	5	2	2	16	0	2	0	3	5	0
21 1/2		4	2	6	7	4	3	1	11	0	0	0	3	3	0
21 3/4		4	2	7	6	1	2	1	5	0	0	0	2	0	0
22		1	1	4	3	2	1	0	3	0	0	0	3	0	0
22 1/4		0	1	1	0	0	0	0	3	0	0	0	2	1	0
22 1/2		0	0	2	3	0	0	0	3	0	0	0	1	0	0
22 3/4		0	0	1	0	0	0	0	0	0	0	0	1	0	0
23		0	0	0	0	0	0	0	3	0	0	0	0	0	0
Total		15	28	48	32	89	62	24	40	21	170	43	32	65	10

Each weight includes boxes up to the next quarter pound heavier; for example, boxes 20 pounds or over but under 20 1/4 pounds are included as 20 pounds.

Table 3. Numbers of Lugs by Net Weights

Cup Pack - 96's														Plastic Trays - 96's																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
Variety	Net Wt. Lb.	Numbers of Lugs					Sunrise	Number of Lugs					Sunrise	Number of Lugs																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
		Rose	Star Grand	Star Grand II	Sun Grand, Early	Sun Grand		Grand Haven	Grand River	Star Grand	Sun Grand, Early	Sun Grand		Grand Haven	Grand River	Star Grand	Sun Grand, Early	Sun Grand																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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Lines show suggested minimum net weights

Each weight includes boxes up to the next quarter pound heavier; for example, boxes 20 pounds or over but under 20 1/4 pounds are included as 20 pounds.

Table 4. Numbers of Lugs by Net Weights

<u>Variety</u>	Cup Pack - 108's				Plastic Trays - 108's	
	Grand River	Princess	Rose	Sunrise	Grand River	Sunrise
Net Wt. Lb.	Number of Lugs				Number of Lugs	
16 1/4						9
16 1/2						2
16 3/4						2
17	2				1	4
17 1/4	1			3	1	7
17 1/2	3			4		2
17 3/4	3		1	3		4
18	2		2	6	3	2
18 1/4	5	2	1	6	3	
18 1/2	4	2	4	5	1	
18 3/4	5		1	1	3	
19	5	1		4	3	
19 1/4	6	3	1	2	7	
19 1/2	6				2	
19 3/4	5				5	
20	4	1			1	
20 1/4	1	1				
20 1/2						
20 3/4		1				
Total	52	11	10	34	30	32

Lines show suggested minimum net weights

Each weight includes boxes up to the next quarter pound heavier; for example, boxes 20 pounds or over but under 20 1/4 pounds are included as 20 pounds.

Table 5. Numbers of Crates by Net Weights

Variety	John River	Grand River	Sunrise	Red River	
Size	4 X 4	4 X 4	4 X 4	4 x 4	
No. Nectarine	176	176	176	176	
Net Weight Lb.	Numbers of Crates			Net Wt. Lb.	Numbers of Crates
26				24	1
26 1/4	1		10	24 1/4	1
26 1/2	1		9	24 1/2	
26 3/4	<u>1</u>		5	24 3/4	
27	2		11	25	1
27 1/4	1		9	25 1/4	5
27 1/2	4		15	25 1/2	
27 3/4	10	<u>2</u>	16	25 3/4	4
28	9	5	6	26	3
28 1/4	10	10	12	26 1/4	2
28 1/2	13	6	8	26 1/2	
28 3/4	14	14	6	26 3/4	
29	12	4	3	27	
29 1/4	15	8	4	27 1/4	
29 1/2	7	12	4	27 1/2	
29 3/4	5	16	2	27 3/4	
30	11	6	1	28	1
30 1/4	3	7	1	28 1/4	2
30 1/2	1	3			
30 3/4	1	3	1		
31		6	2		
31 1/4		2			
31 1/2		4			
31 3/4		5			
32		2			
Total	132	116	125		20

Lines show suggested minimum weights

Each weight includes boxes up to the next quarter pound heavier; for example, boxes 20 pounds or over but under 20 1/4 pounds are included as 20 pounds.



Table 6. Suggested minimum required net weights of nectarines in lugs and crates, pounds

Size	80	88	96	108	4 x 4
Golden Grand	20				
Gold King	20	20			
Grandeur	20	20			
Grand River		19	18	17	28
John Rivers					27
Le Grand, Early	20	19			
Le Grand	20	19			
Le Grand, Late	20	20			
Princess		19	18	18	
Red Grand	20	19			
Red River					25
Rose			18	17	
Star Grand	20	19	18		
Star Grand II	20		18		
Sun Grand, Early	20	19	18		
Sun Grand	19	18	18		
Sunrise	19	18	17	17	26

Table 7. Weights of 100 nectarines, corresponding to lug and crate weights as shown.

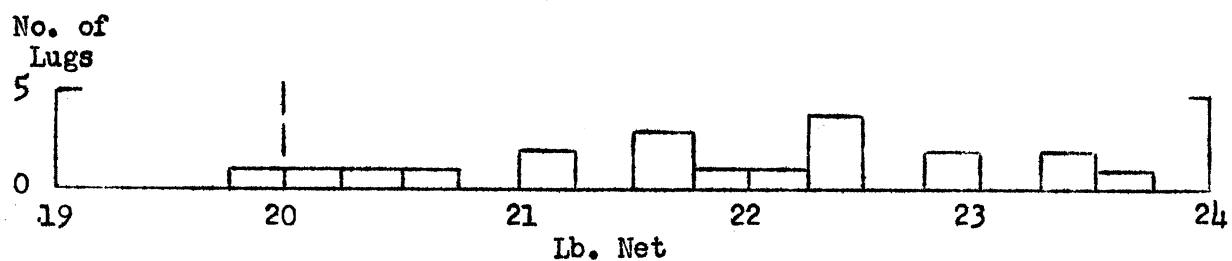
Lug net weight, lb	Lug pack				4 x 4 crate net weight, lb	Weight of 100 nectarines
	80	88	96	108		
Weight of 100 nectarines						
16	20	18	16 1/2	15	24	13 1/2
16 1/2	20 1/2	19	17	15 1/2	24 1/2	14
17	21	19 1/2	18	16	25	14
17 1/2	22	20	18 1/2	16	25 1/2	14 1/2
18	22 1/2	20 1/2	19	16 1/2	26	15
18 1/2	23	21	19 1/2	17	26 1/2	15
19	24	21 1/2	20	17 1/2	27	15 1/2
19 1/2	24 1/2	22	20 1/2	18	27 1/2	15 1/2
20	25	23	21	18 1/2	28	16
20 1/2	25 1/2	23 1/2	21 1/2	19	28 1/2	16
21	26	24	22	19 1/2	29	16 1/2
21 1/2	27	24 1/2	22 1/2	20	29 1/2	17

Table 8. Numbers of nectarines in a 10-pound sample, corresponding to lug and crate weights as shown.

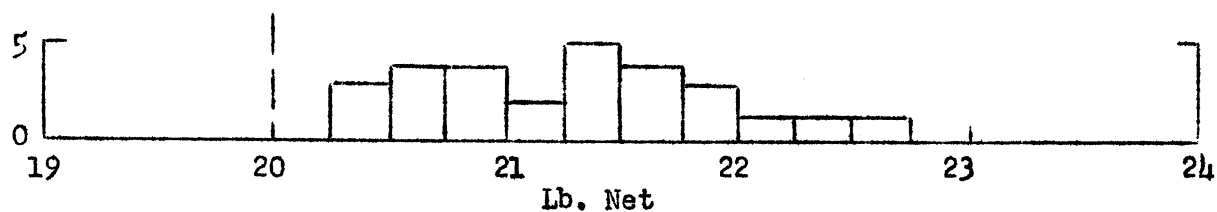
Lug net weight, lb	Lug pack				4 x 4 crate net weight, lb	Number of nectarines in a 10-lb sample
	80	88	96	108		
Number of nectarines in a 10-pound sample						
16	50	55	60	68	24	73
16 1/2	48	53	58	65	24 1/2	72
17	47	52	56	64	25	70
17 1/2	46	50	55	62	25 1/2	69
18	44	49	53	60	26	68
18 1/2	43	48	52	58	26 1/2	66
19	42	46	50	57	27	65
19 1/2	41	45	49	55	27 1/2	64
20	40	44	48	54	28	63
20 1/2	39	43	47	53	28 1/2	62
21	38	42	46	51	29	61
21 1/2	37	41	45	50	29 1/2	60

Figure 1. Number of Lugs by Net Weights

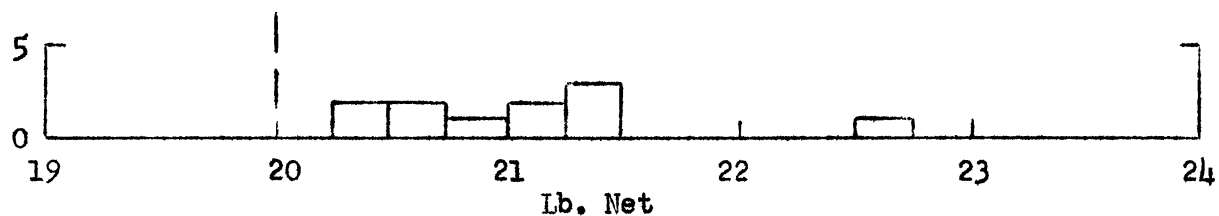
Dotted lines show suggested minimums



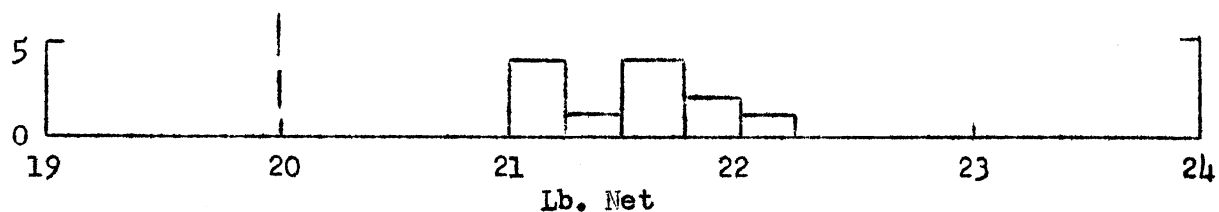
Golden Grand Cup Pack - 80's 20 L. A. Lugs



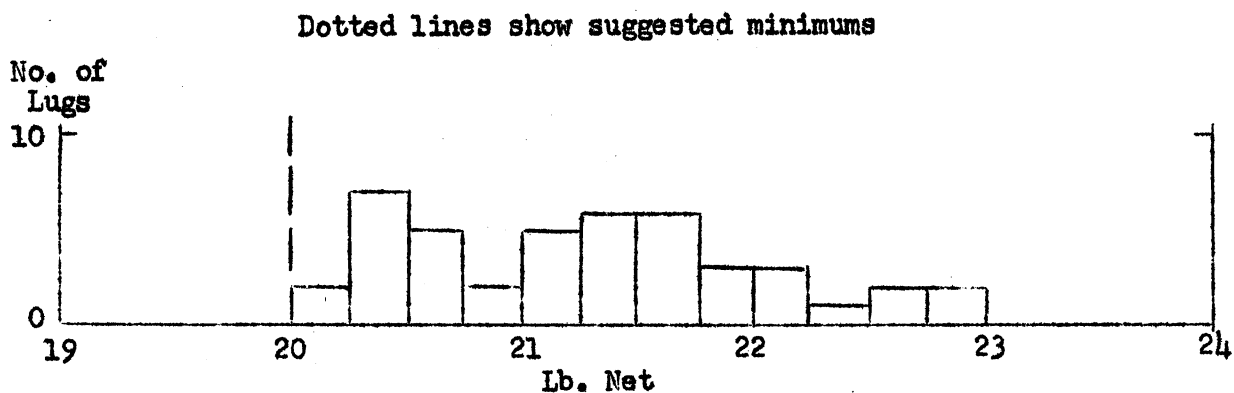
Gold King Cup Pack - 50's 28 L. A. Lugs



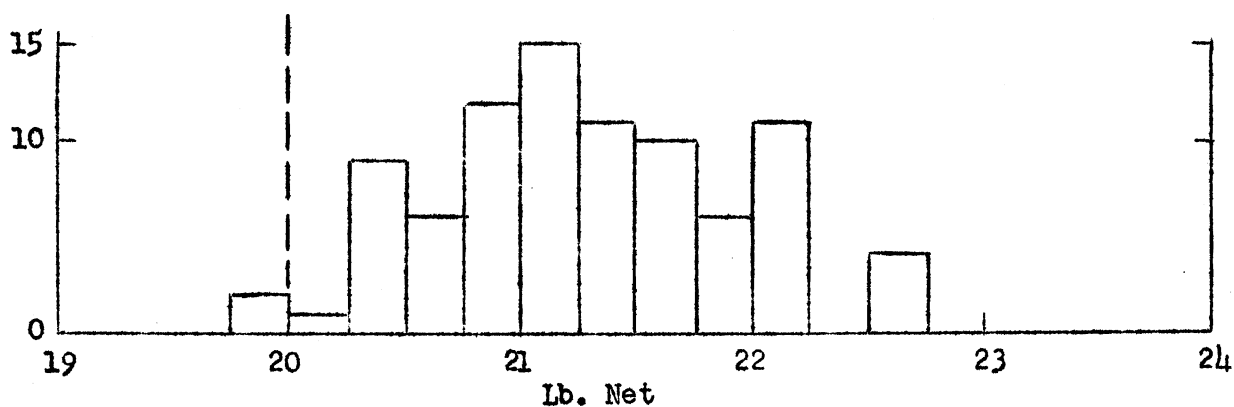
Grandeur Cup Pack - 80's 11 L. A. Lugs



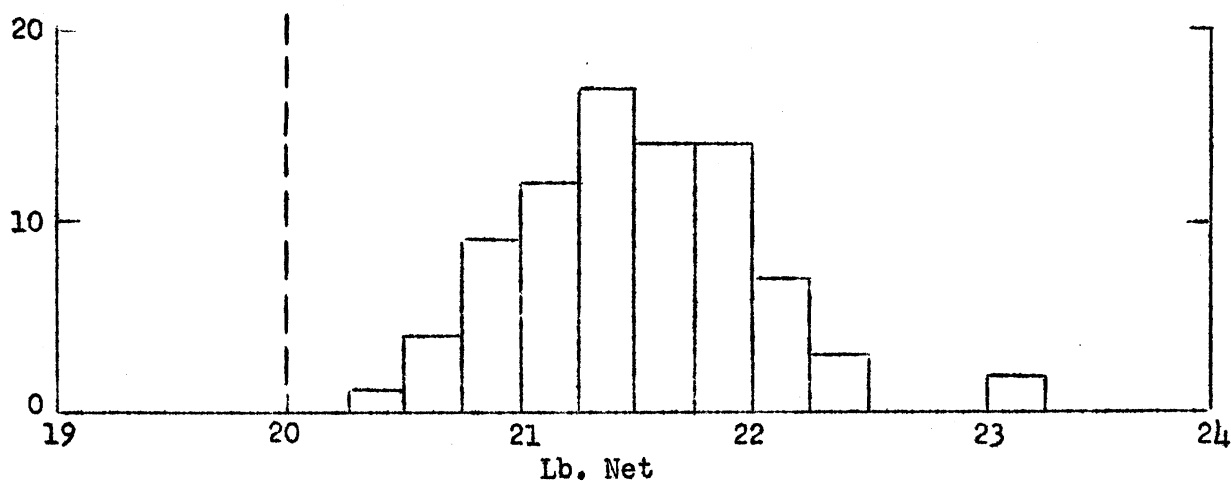
Red Grand Cup Pack - 80's 12 L. A. Lugs



Early Le Grand Cup Pack - 80's 44 L. A. Lugs



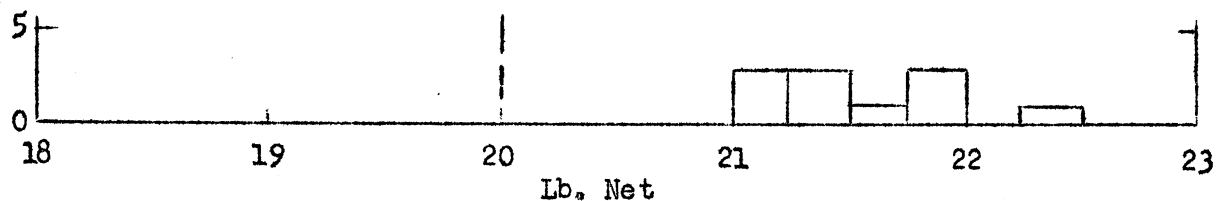
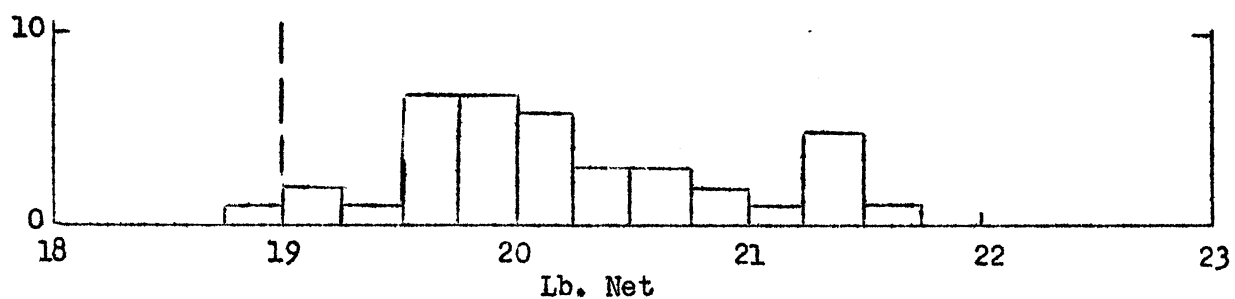
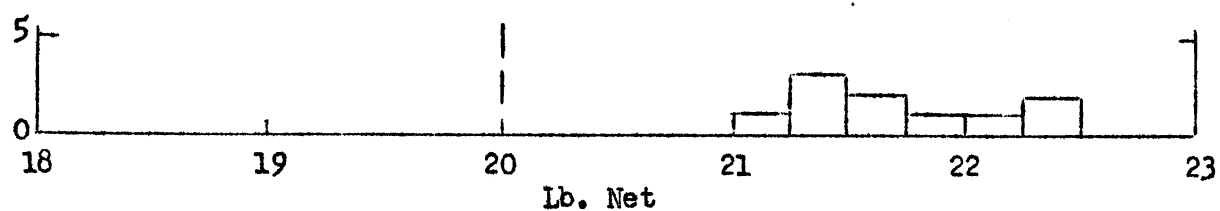
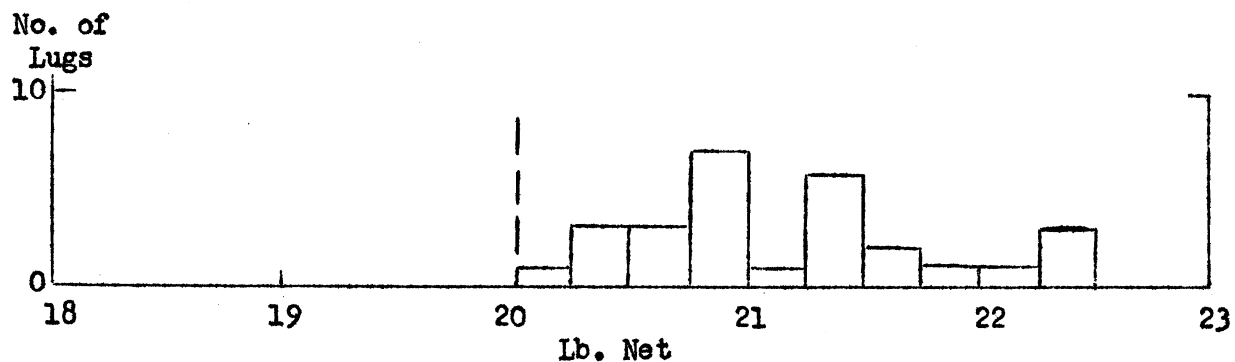
Le Grand Cup Pack - 80's 87 L. A. Lugs



Late Le Grand Cup Pack - 80's 83 L. A. Lugs

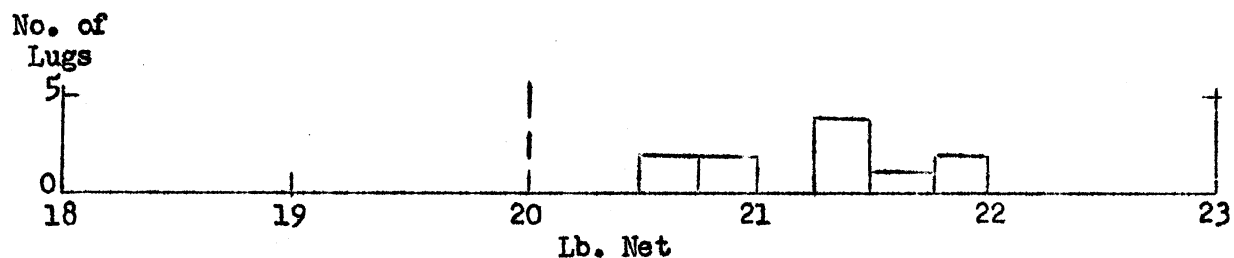
**Figure 3. Number of Lugs by Net Weights**

Dotted lines show suggested minimums

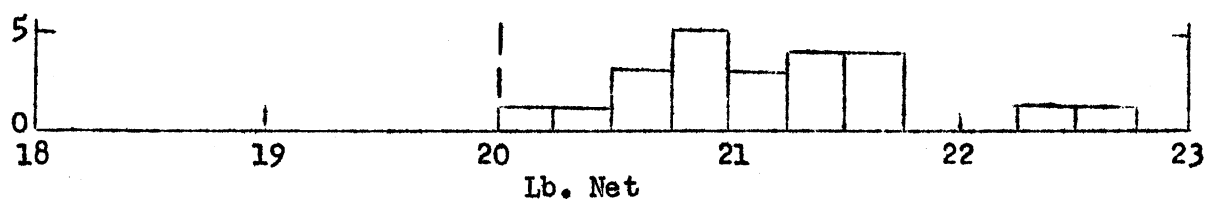


**Figure 4. Number of Lugs by Net Weights**

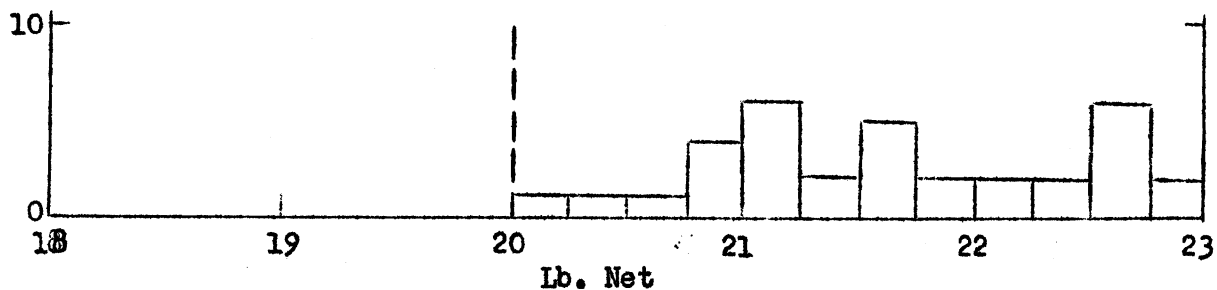
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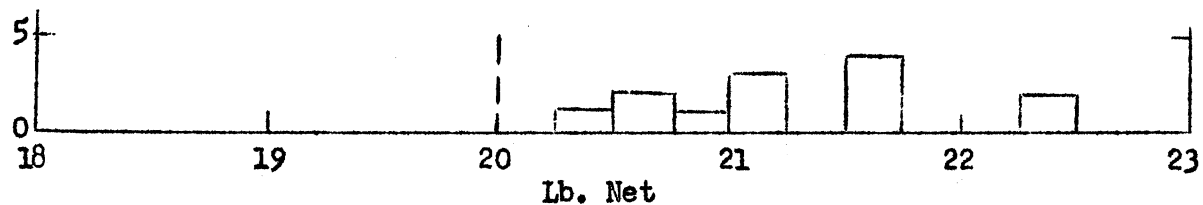
Gold King Plastic Tray - 80's 11 L. A. Lugs



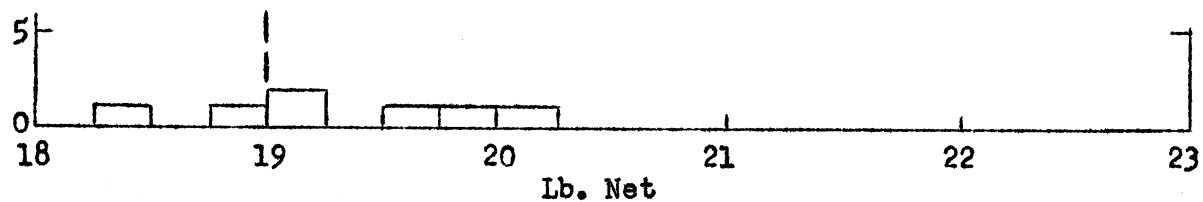
Le Grand Plastic Tray - 80's 23 L. A. Lugs



Late Le Grand Plastic Tray - 80's 34 L. A. Lugs

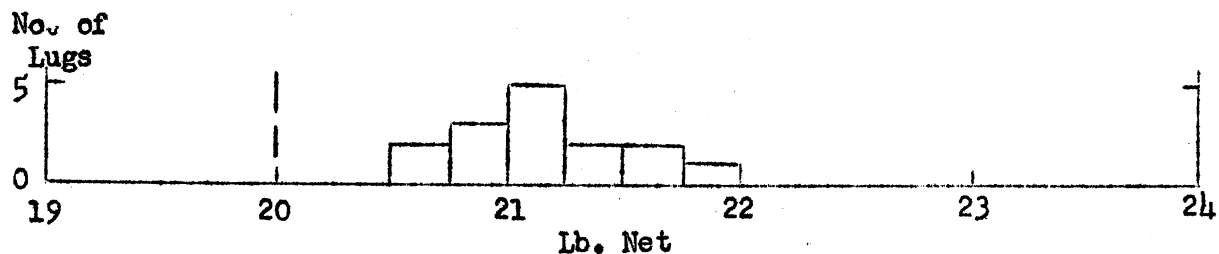


Red Grand Plastic Tray - 80's 13 L. A. Lugs

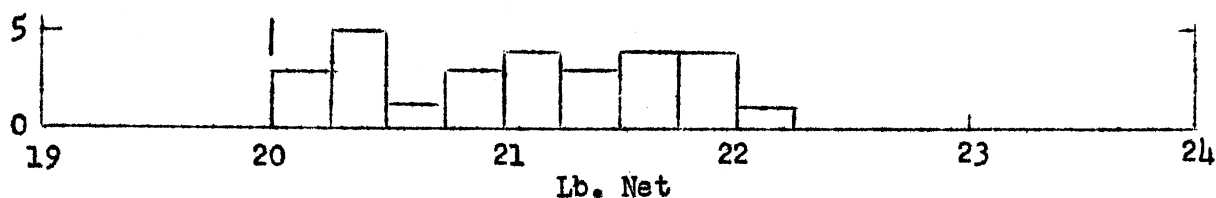


Sunrise Plastic Tray - 80's 7 L. A. Lugs

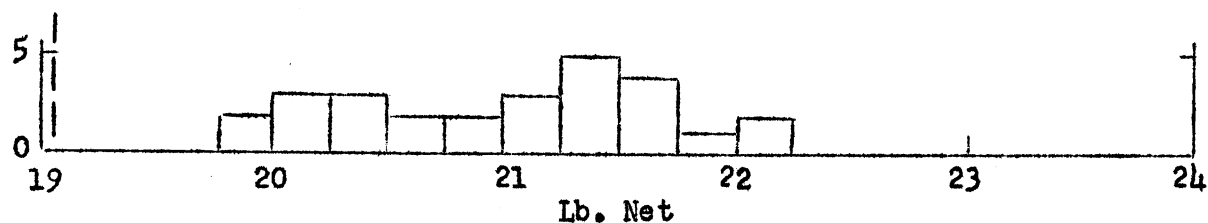
Dotted lines show suggested minimums



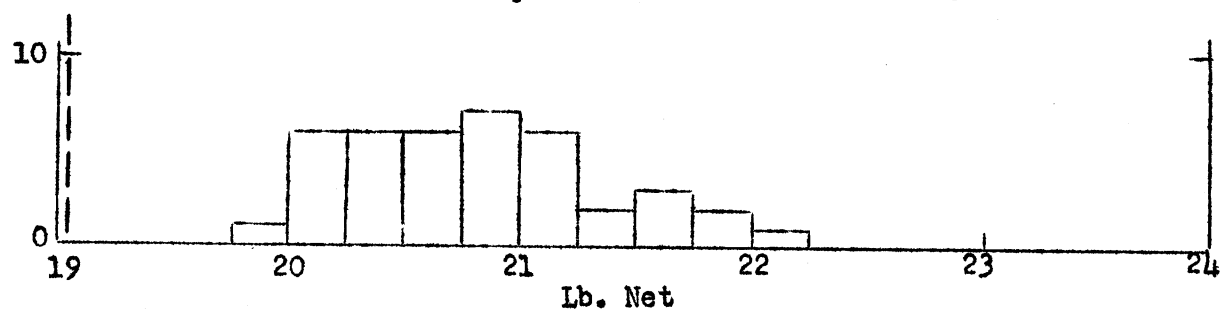
Gold King Cup Pack - 88's 15 L. A. Lugs



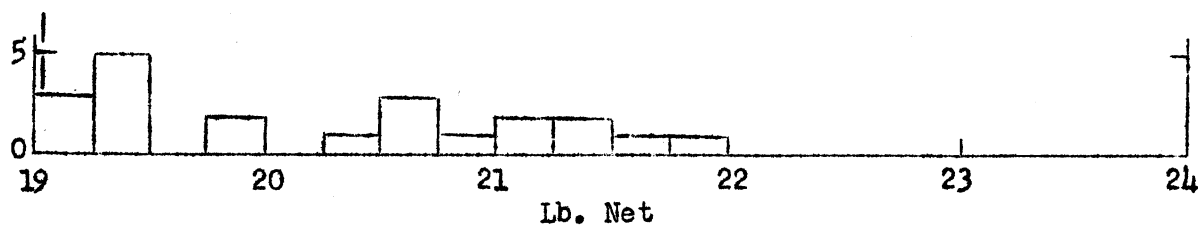
Grandeur Cup Pack - 88's 28 L. A. Lugs



Princess Cup Pack - 88's 27 L. A. Lugs



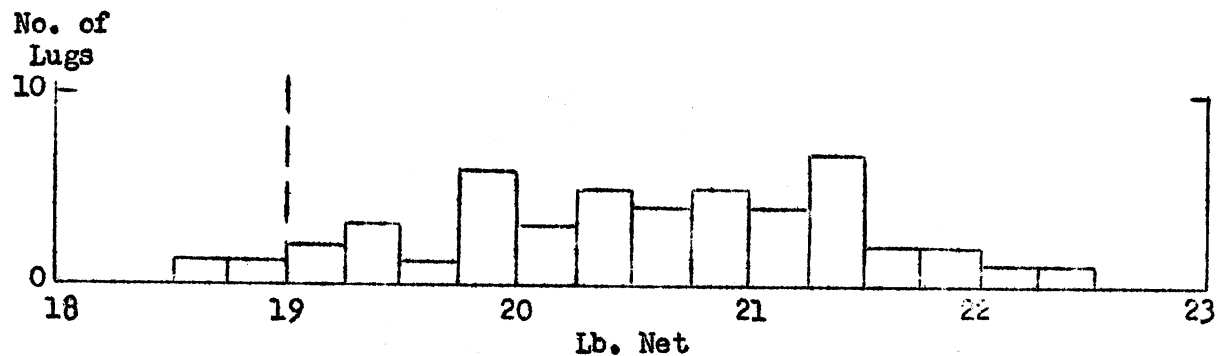
Red Grand Cup Pack - 88's 40 L. A. Lugs



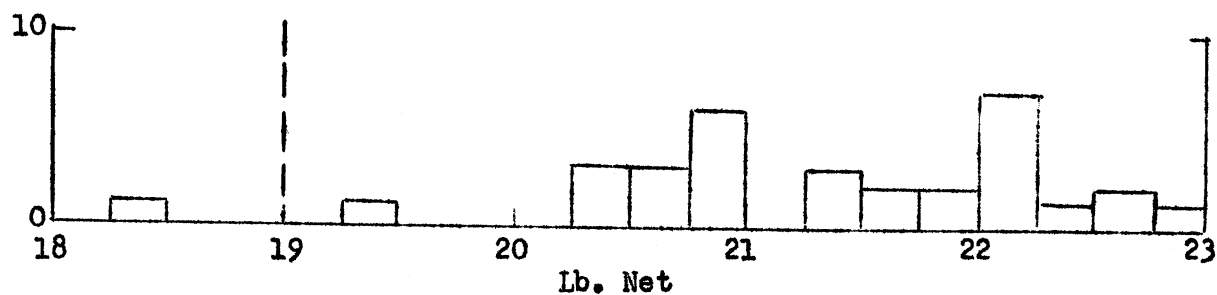
Star Grand Cup Pack - 88's 21 L. A. Lugs



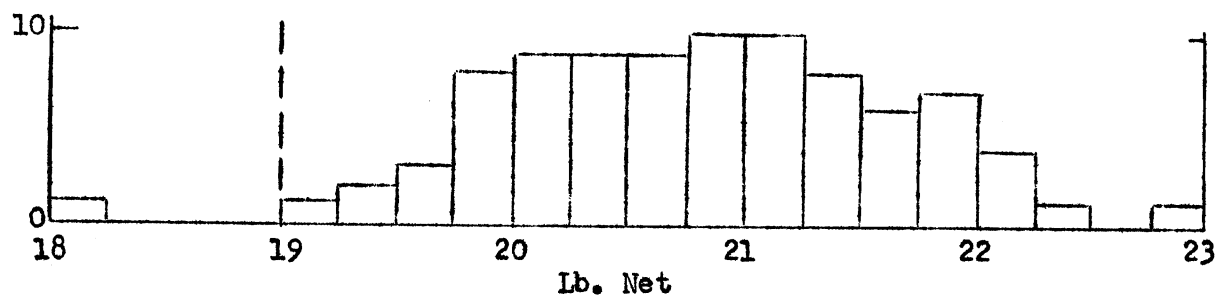
Dotted lines show suggested minimums



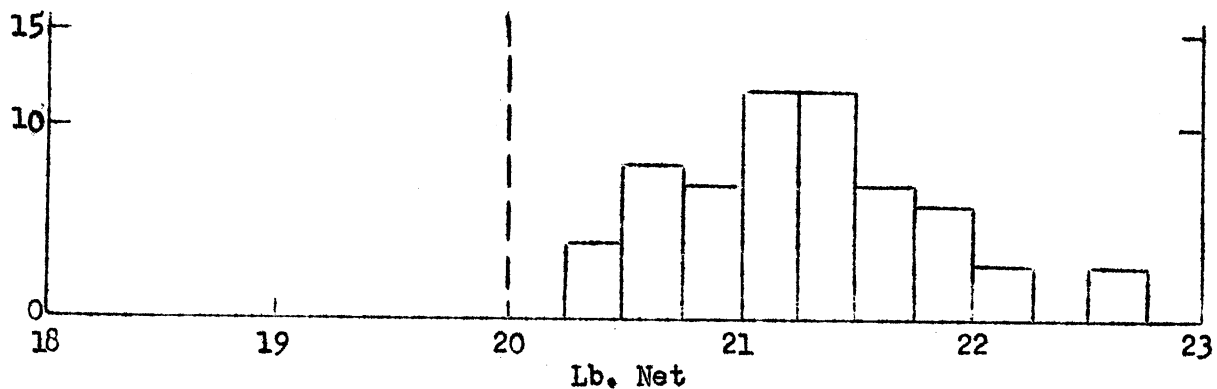
Grand River Cup Pack - 88's 48 L. A. Lugs



Early Le Grand Cup Pack - 88's 32 L. A. Lugs



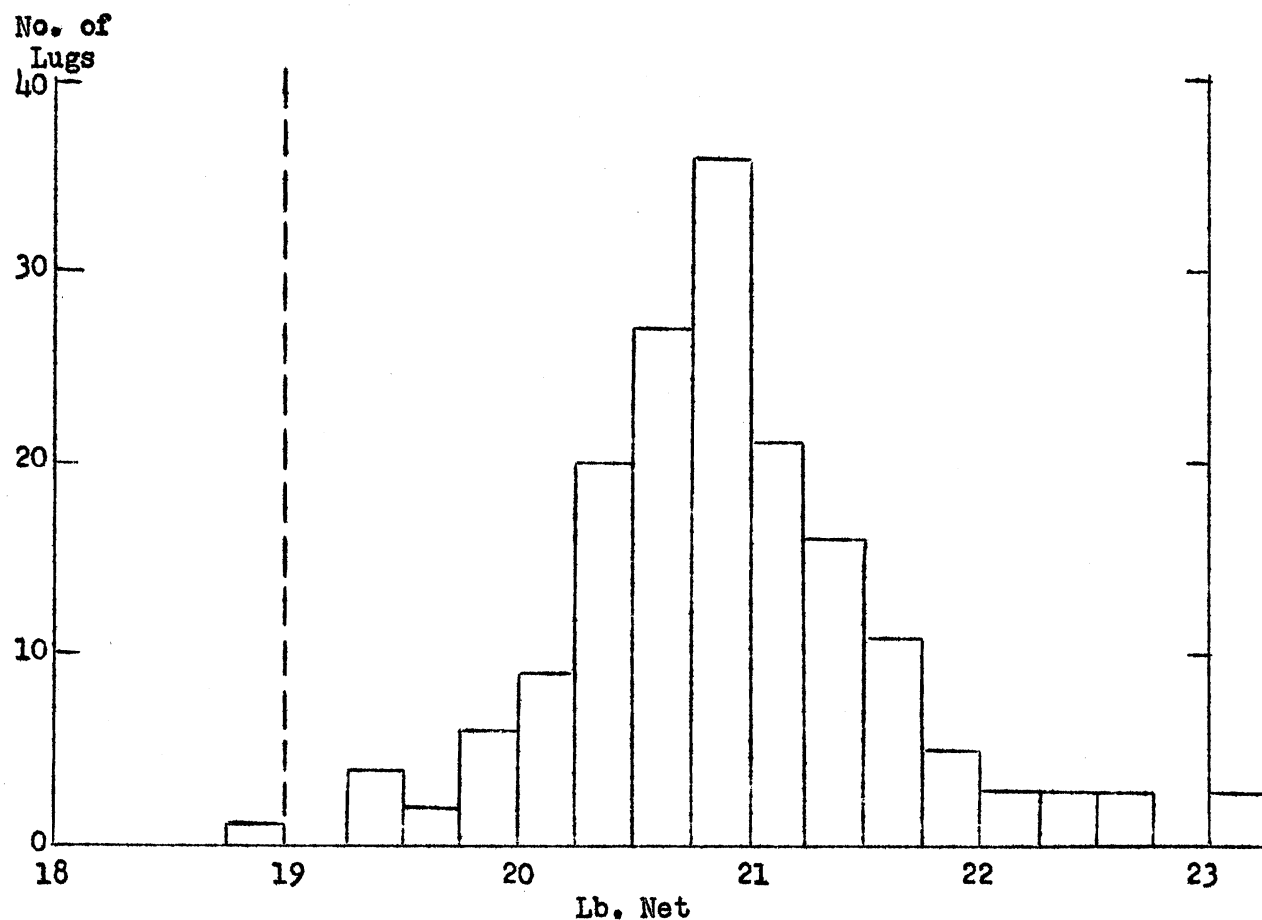
Le Grand Cup Pack - 88's 89 L. A. Lugs



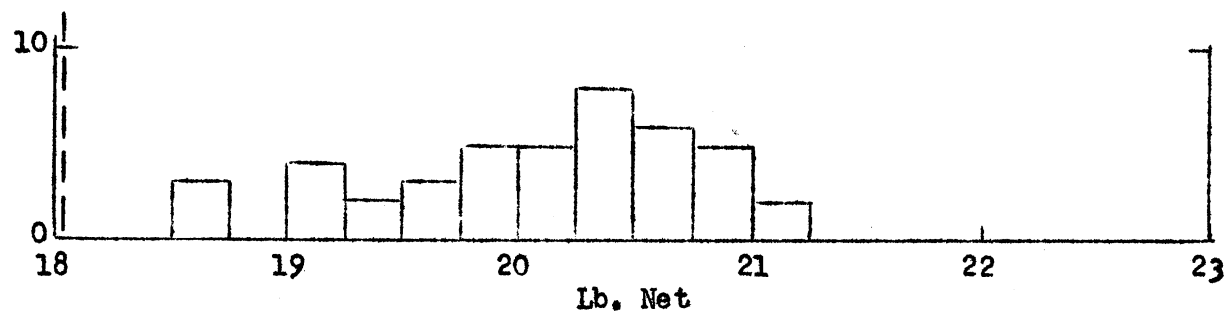
Late Le Grand Cup Pack - 88's 62 L. A. Lugs

**Figure 7. Number of Lugs by Net Weights**

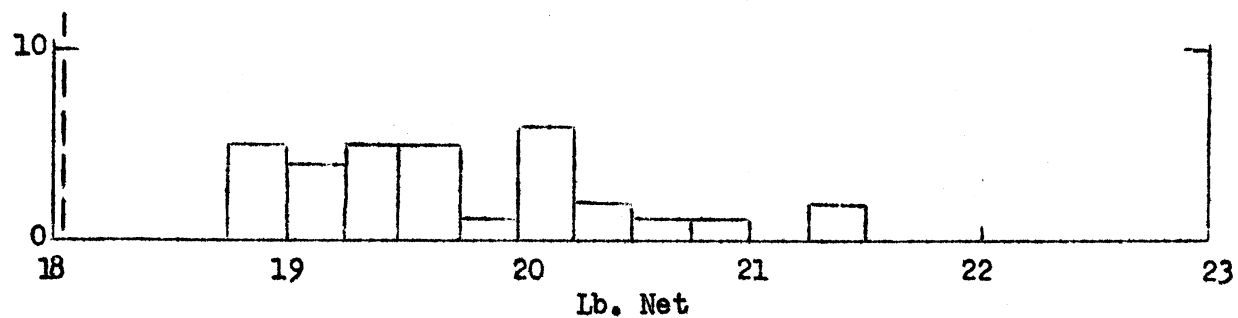
Dotted lines show suggested minimums



Early Sun Grand Cup Pack - 88's 170 L. A. Lugs



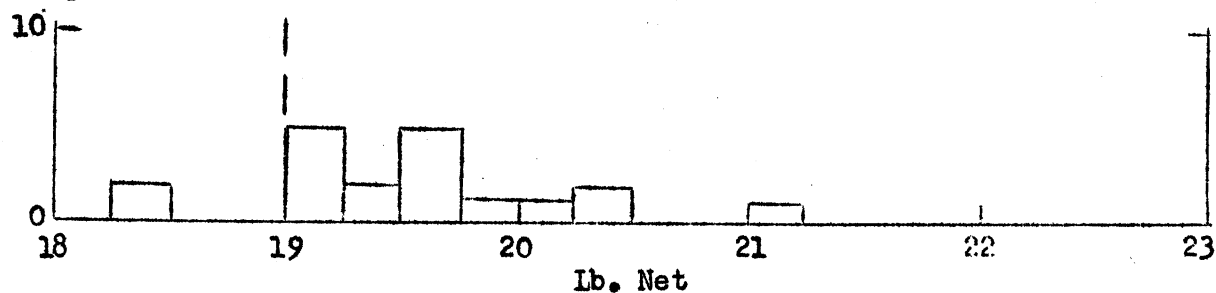
Sun Grand Cup Pack - 88's 43 L. A. Lugs



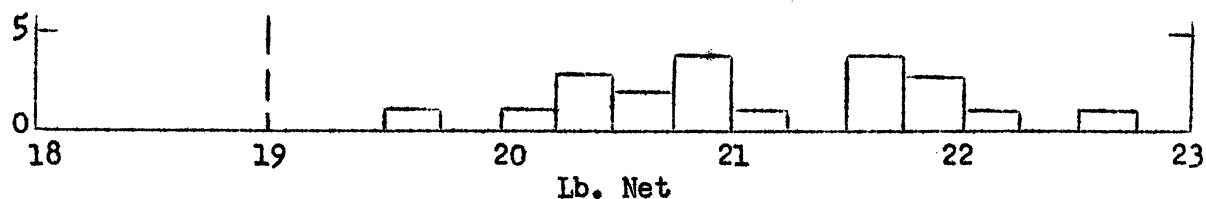
Sun Rise Cup Pack - 88's 32 L. A. Lugs

No. of  
Lugs

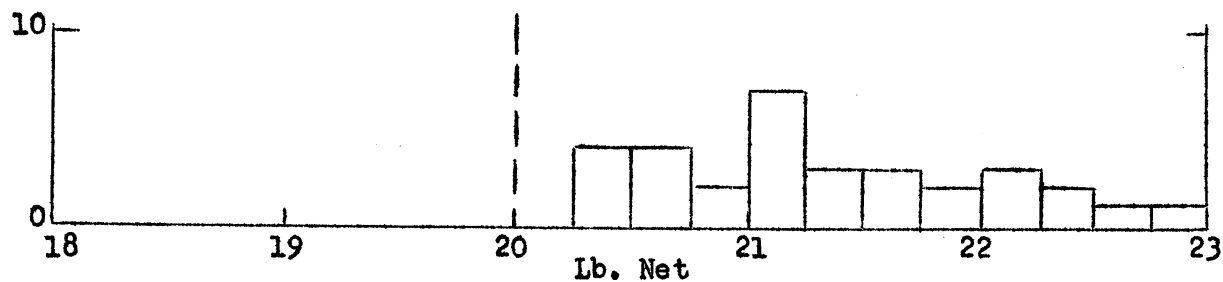
Dotted Lines show suggested minimums



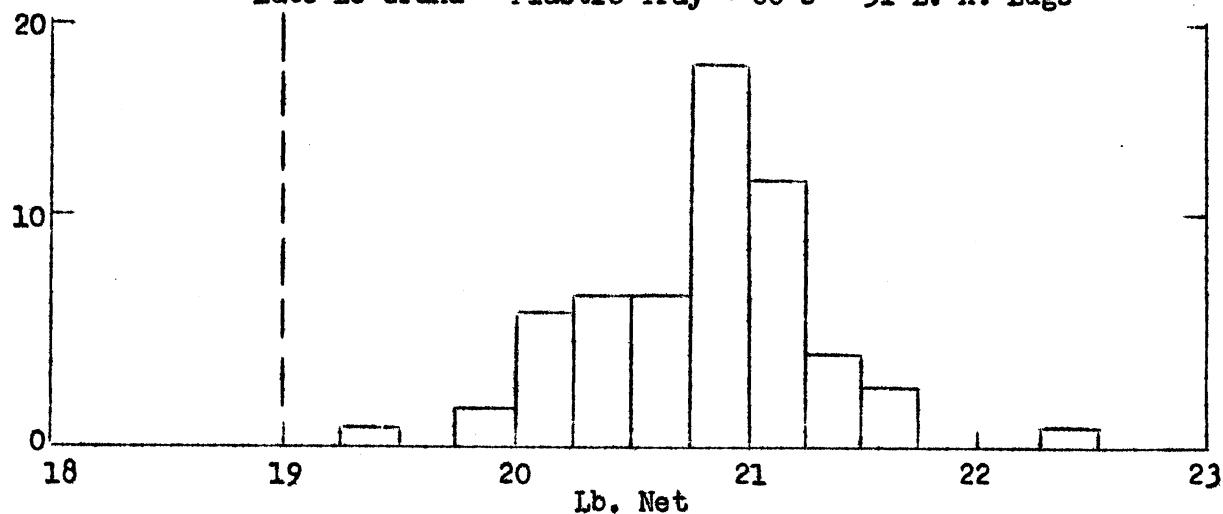
Early Le Grand Plastic Tray - 88's 19 L. A. Lugs



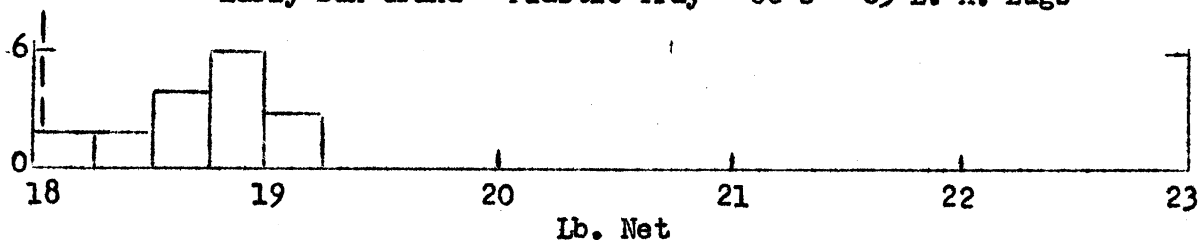
Le Grand Plastic Tray - 88's 21 L. A. Lugs



Late Le Grand Plastic Tray - 88's 31 L. A. Lugs



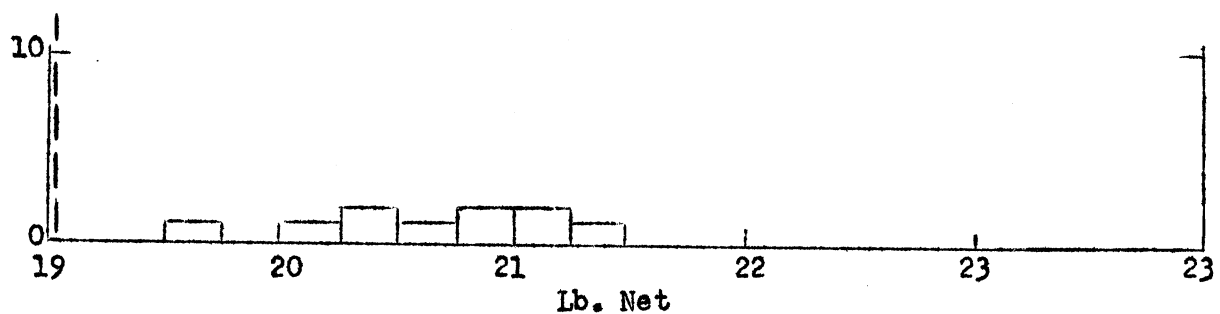
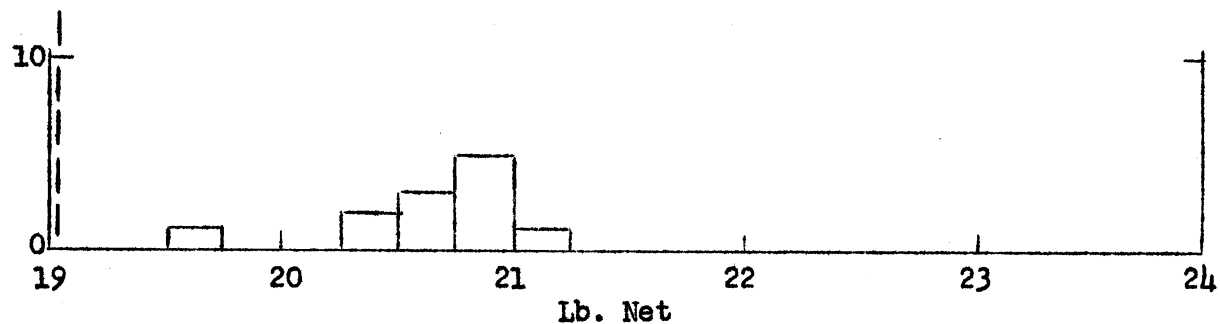
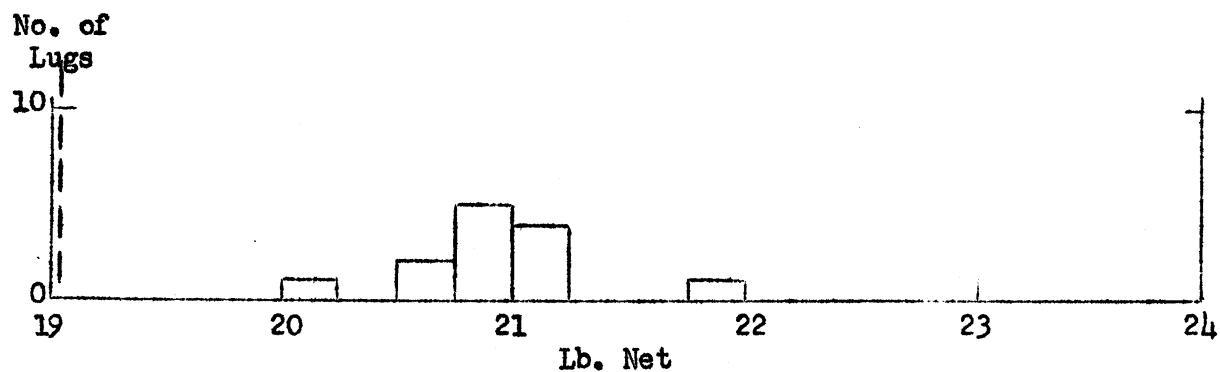
Early Sun Grand Plastic Tray - 88's 65 L. A. Lugs



Sunrise Plastic Tray - 88's 17 L. A. Lugs

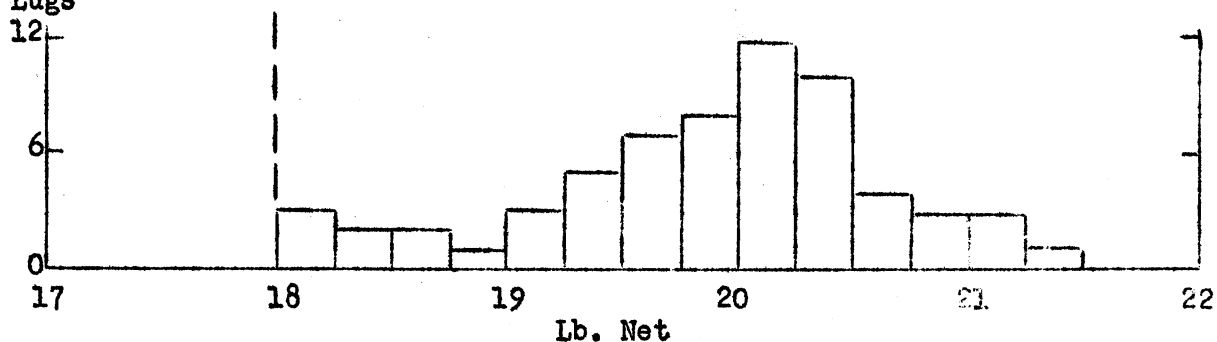
Figure 9. Number of Lugs by Net Weights

Dotted lines show suggested minimums

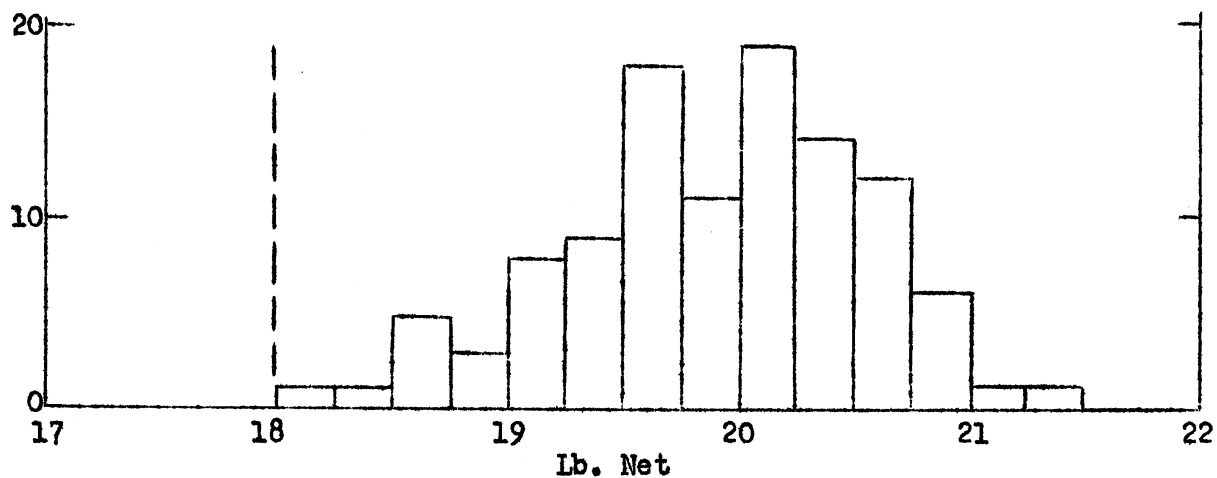


**Figure 10. Number of Lugs by Net Weights**No. of  
Lugs

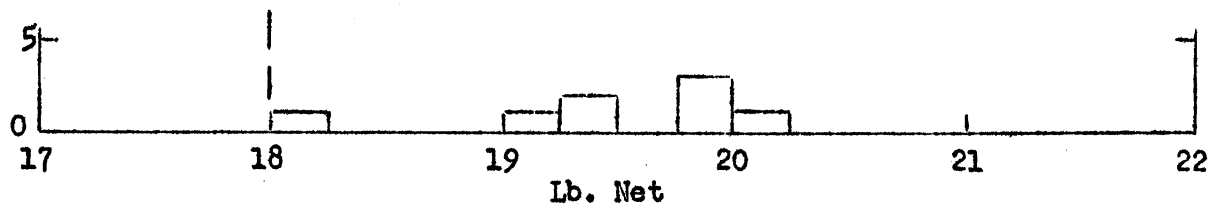
Dotted lines show suggested minimums



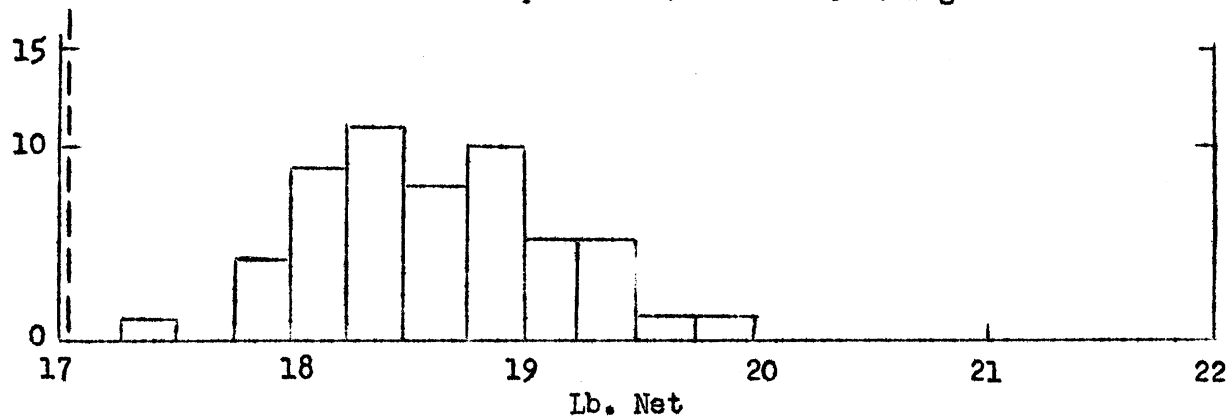
Grand River Cup Pack - 96's 65 L. A. Lugs



Early Sun Grand Cup Pack - 96's 119 L. A. Lugs



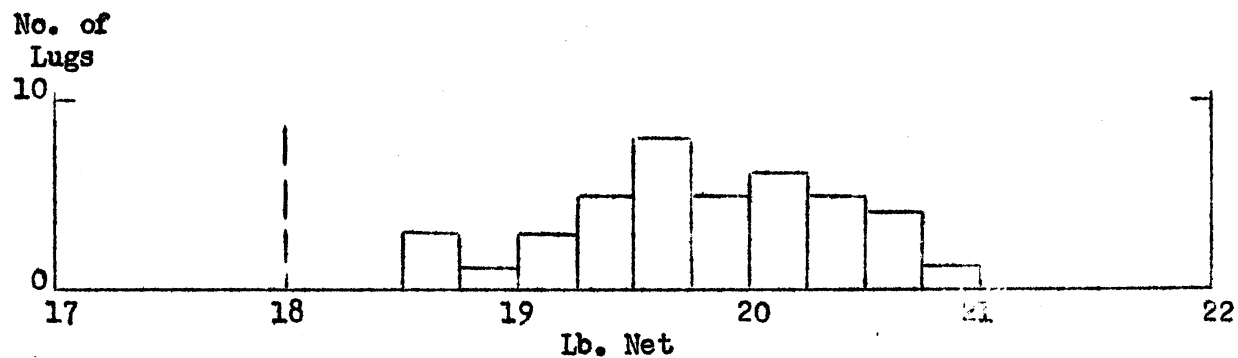
Sun Grand Cup Pack - 96's 8 L. A. Lugs



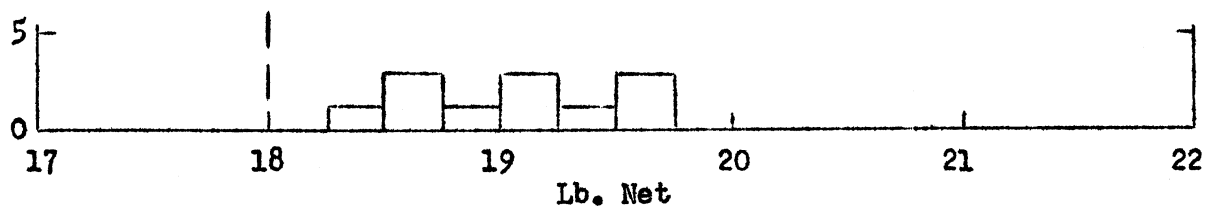
Sunrise Cup Pack - 96's 55 L. A. Lugs

Figure 11. Number of Lugs by Net Weights

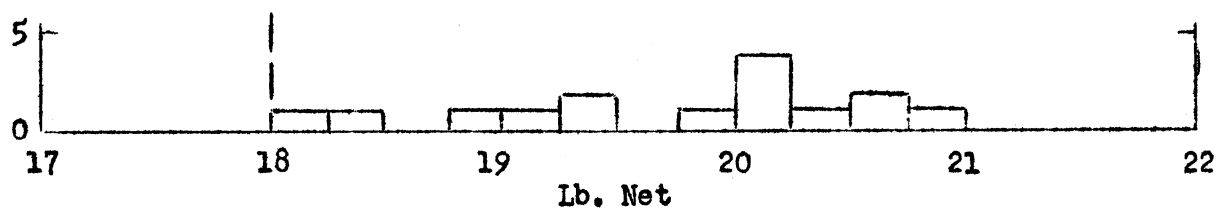
Dotted lines show suggested minimums



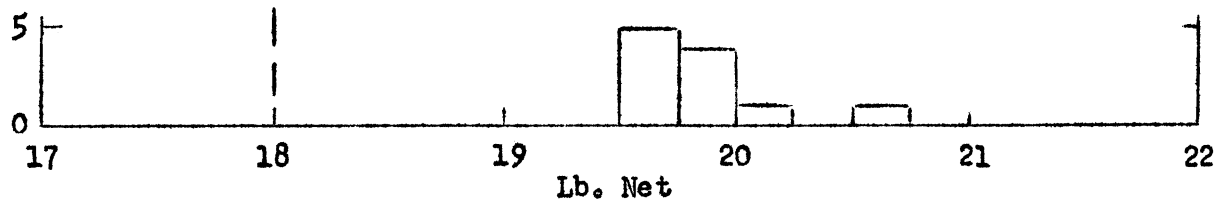
Princess Cup Pack - 96's 41 L. A. Lugs



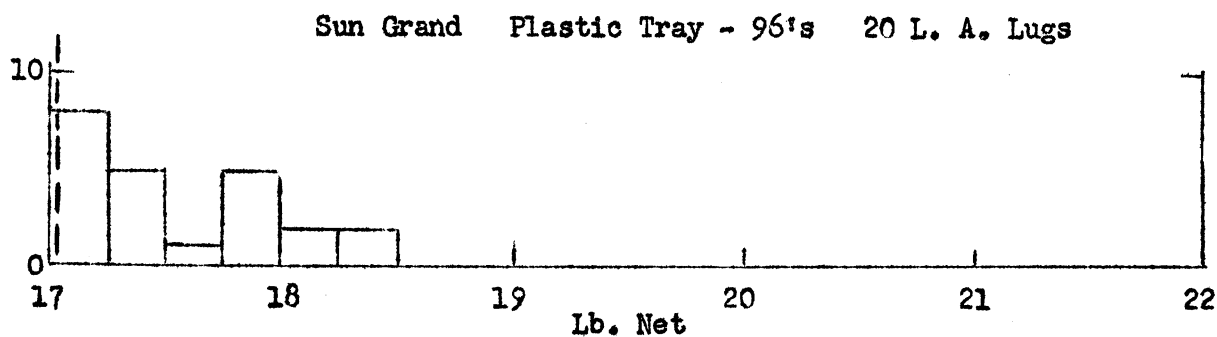
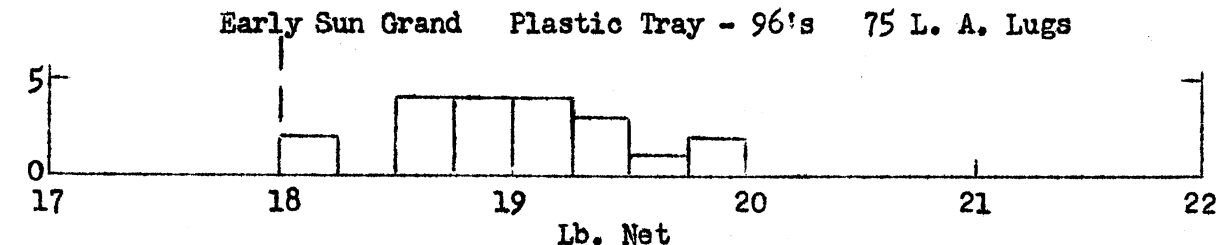
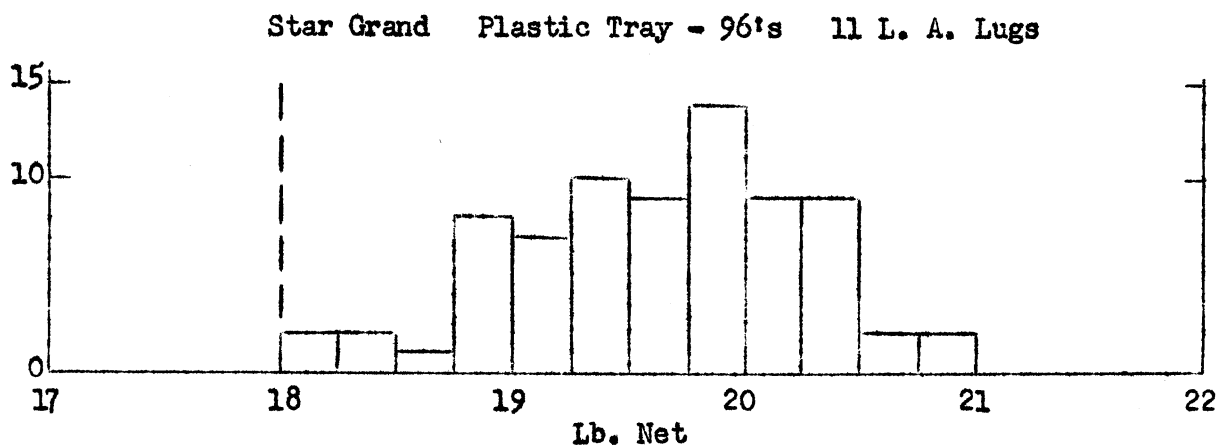
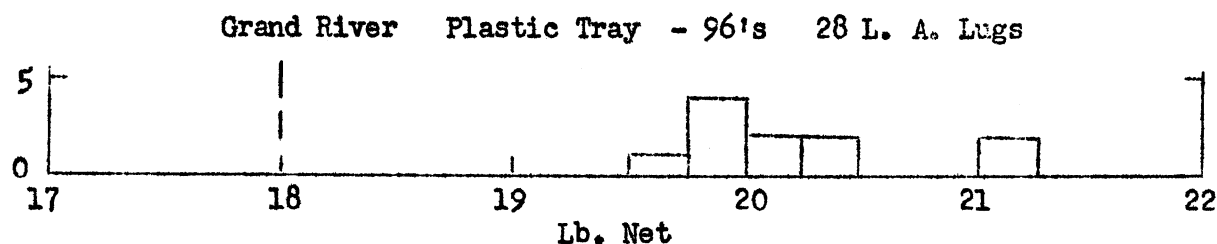
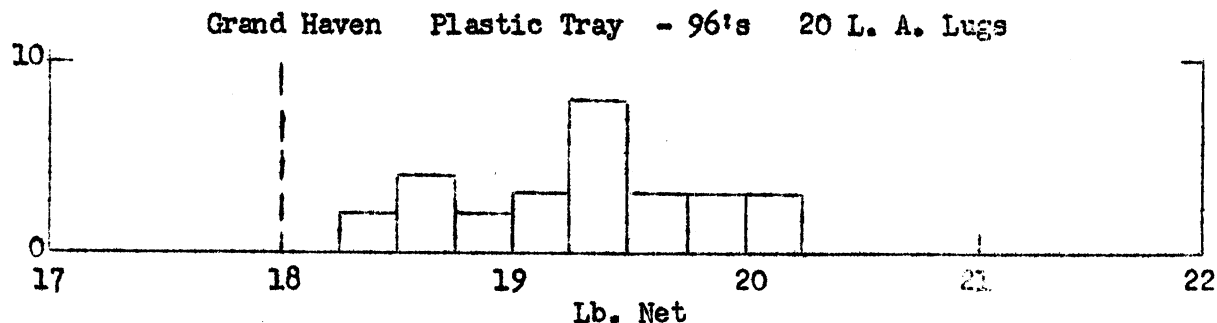
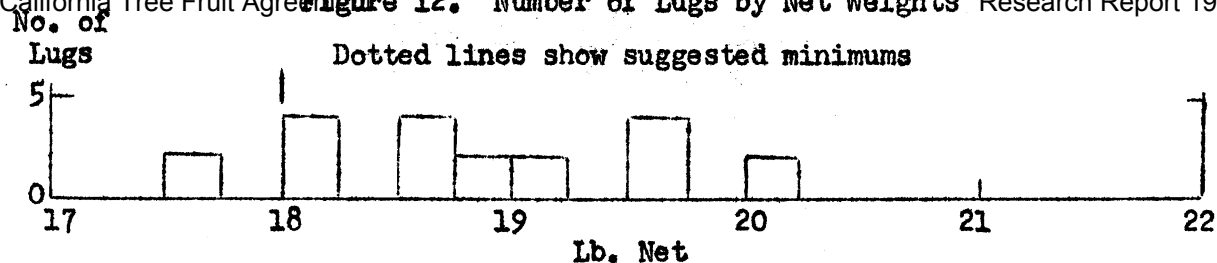
Rose Cup Pack - 96's 12 L. A. Lugs



Star Grand Cup Pack - 96's 15 L. A. Lugs



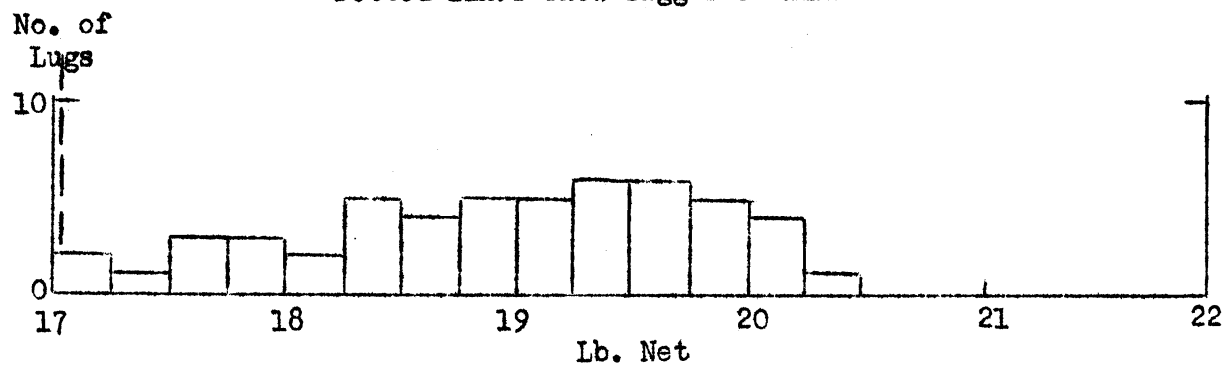
Star Grand II Cup Pack - 96's 11 L. A. Lugs



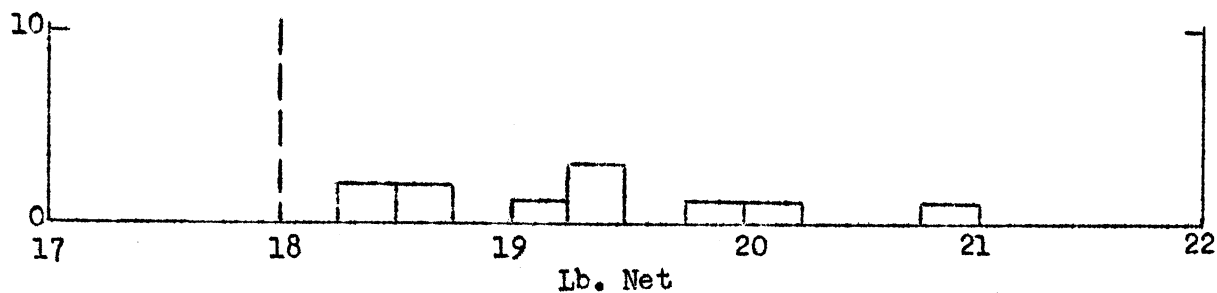
Sunrise Plastic Tray - 96's 23 L. A. Lugs

Figure 13. Number of Lugs by Net Weights

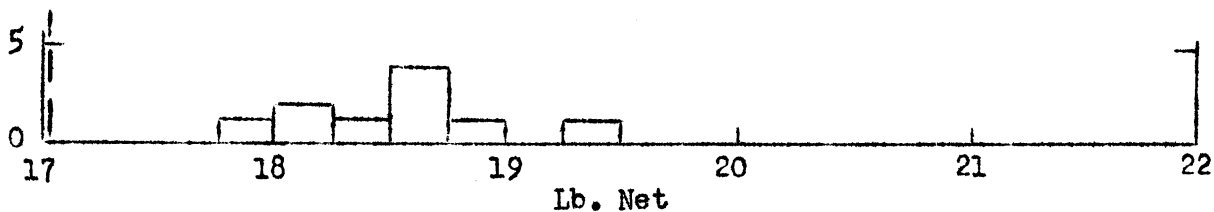
Dotted lines show suggested minimums



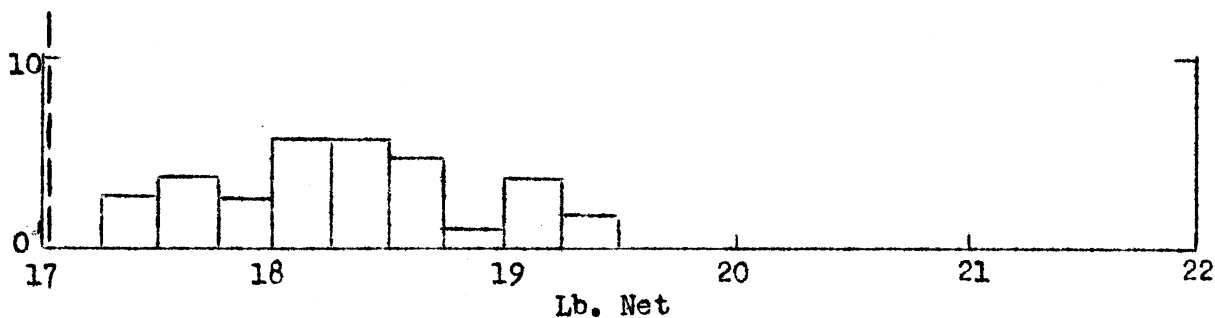
Grand River Cup Pack - 108's 52 L. A. Lugs



Princess Cup Pack - 108's 11 L. A. Lugs



Rose Cup Pack - 108's 10 L. A. Lugs

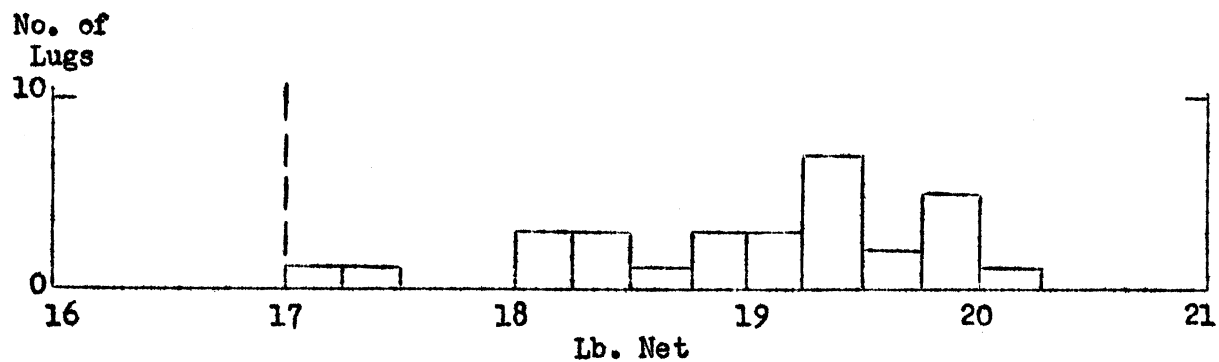


Sunrise Cup Pack - 108's 34 L. A. Lugs

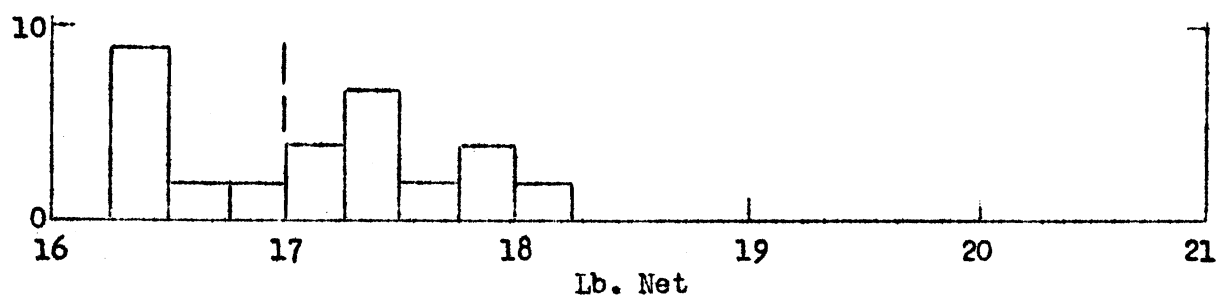


Figure 14. Number of Lugs by Net Weights

Dotted lines show suggested minimums

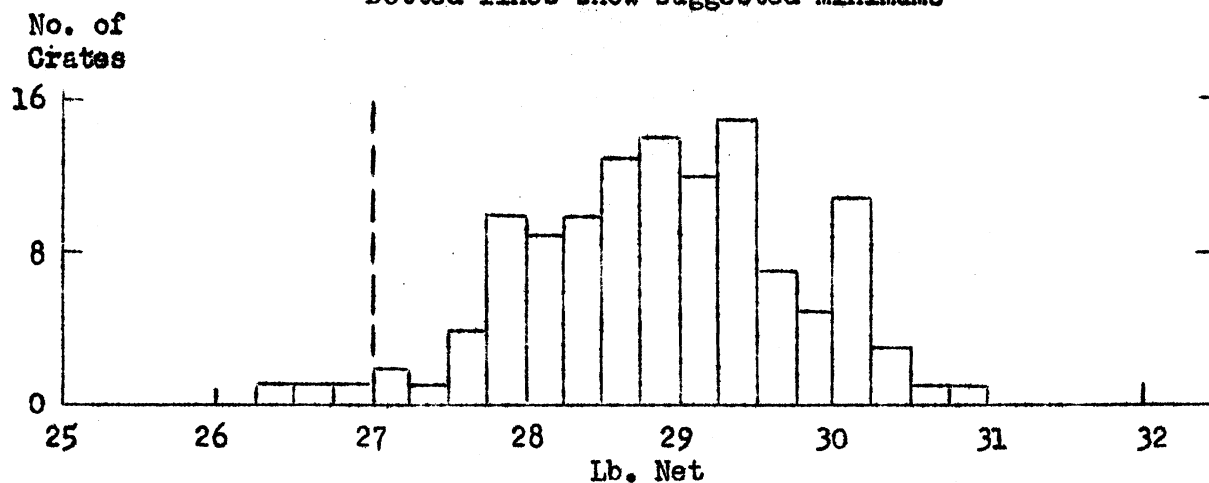


Grand River Plastic Tray - 108's 30 L. A. Lugs

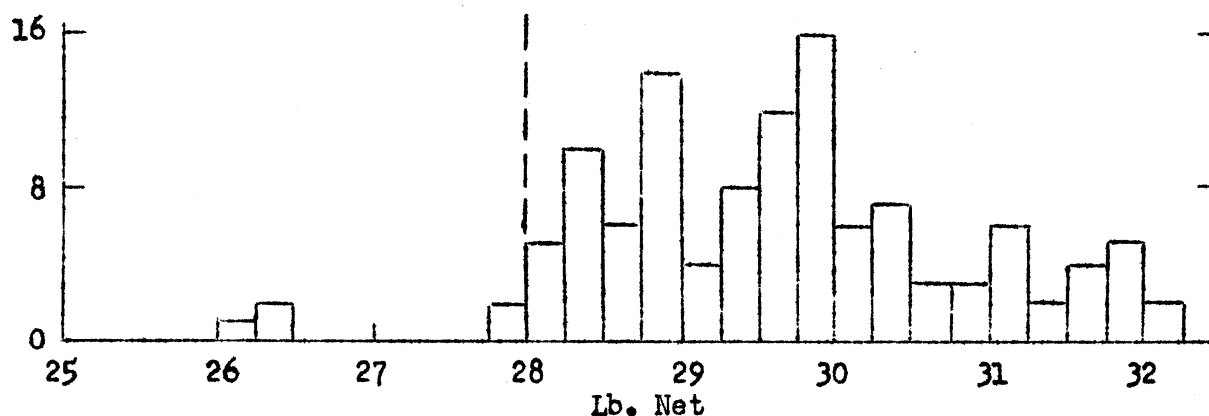


Sunrise Plastic Tray - 108's 32 L. A. Lugs

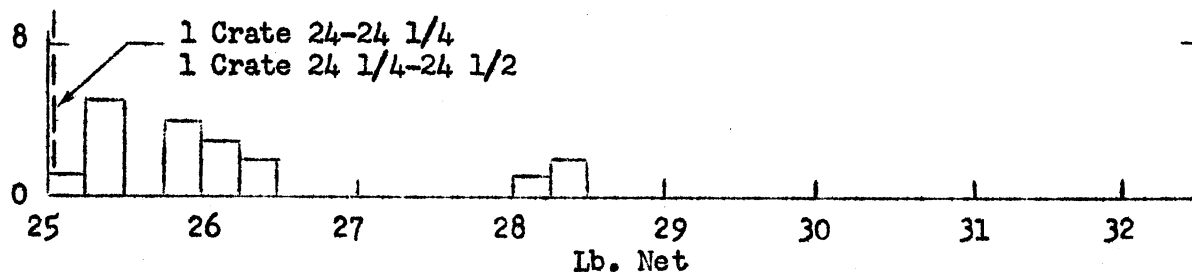
Dotted lines show suggested minimums



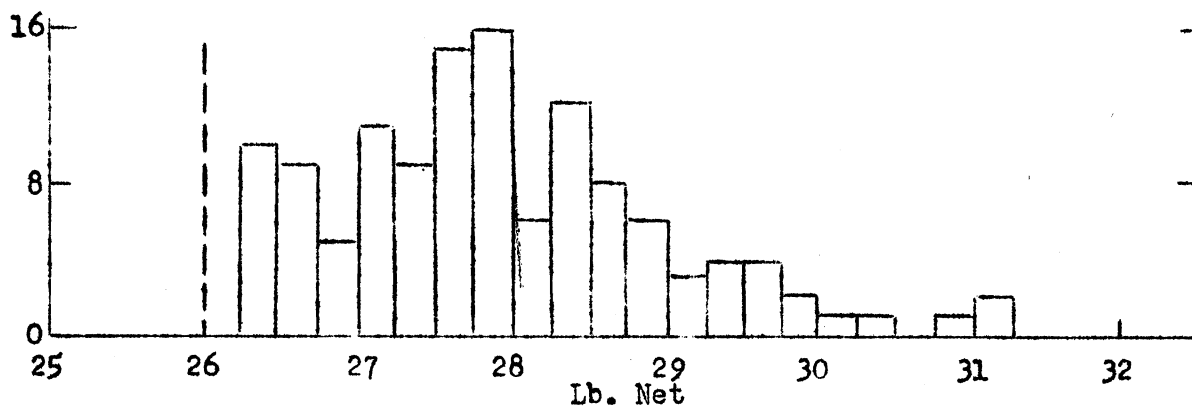
John River 4 X 4 (176) 123 Crates



Grand River 4 X 4 (176) 116 Crates



Red River 4 X 4 (176) 20 Crates



Sunrise 4 X 4 (176) 125 Crates