

## **Shuttling: An In-Depth Study** by Dr. Emily Plant

In 1990, Coolmore and Robert Sangster partnered with Arrowfield and John Messara to purchase Danehill to stand dual-hemisphere duty in Ireland and Australia. Danehill, by Danzig, was an American-bred turf sprinter who was a sensational sire in both the Northern and Southern Hemispheres. His success sparked the explosion of standing stallions in dual locations, and the resulting mixing of genes from around the world is no doubt revolutionizing the breed.

Controversy surrounding the practice centers around the assumption that stallions are harmed by the absence of an "off season", that using them on double duty is detrimental in some shape, either by reducing the length of the horses's life, decreasing his fertility, or making him less likely to sire good horses. A lot of questions have been asked, and a lot of speculation has taken place regarding the topic, but reliable research on the subject matter is scarce. Emily's research, presented below, sets out to provide evidence-based answers to some of the most important questions surrounding shuttling.

This study is excerpted from our private research publication, known as The Stallion Spectator Ratings. This is the first time we have ever published for public consumption anything from this book, as it is available only by private subscription to a limited number of entities. We've made an exception to our publishing rules for this topic, as the news is simply too big to keep to ourselves. Emily finds that shuttle stallions do not have lower fertility, do not die younger, and shuttling does not affect their success rate as sires of good horses. As far as we know, this is the first study of its kind, although it is worth noting that researchers in Veterinary Science have recently published research which also finds no difference in fertility between those horses who shuttle and those who do not.

We trust you will find this research of interest and we will be interested to hear what people think!

-Bill Oppenheim

## THE EFFECT OF SHUTTLING ON STALLION FERTILITY, MORTALITY, AND PERFORMANCE

By Dr. Emily Plant

The horse business is positively full of interesting questions which are difficult to answer. Without true scientific evidence to back up suppositions, we're left to make assumptions about the truth. One of these such 'difficult questions' is how shuttling stallions to stand dual-hemisphere duty affects their health and performance. In this modern world where news knows no bounds of time or space, we receive the published information and make assumptions. We can receive real-time updates of every moment in a stallion's life- look for example to California Chrome and American Pharoah, who received extensive media attention of their travels to the Southern Hemisphere for the 2017 covering season. With this instant access to information, we hear all of the news- both the good and the bad. We know when the stallions are happy and enjoying their life of perpetual springtime grazing virtually year-round on green pastures; we also know when things go wrong.

It's true, there have been high-profile cases of stallions dying while standing on Southern Hemisphere time or while in transit to or from their destination. Harlan's Holiday comes to mind, who was euthanized while standing in Argentina at age 14 in 2013. War Pass died at age 5 after collapsing in his paddock the day after returning from Australia. The dearly departed Scat Daddy was a dual-hemisphere star who suffered cardiac collapse at age 11.

There's also a belief that shuttling will impact a stallion in terms of his fertility, or otherwise deplete his ability to sire top horses. Criticisms are leveled that it is simply unnatural for a stallion to breed year-round, and that the winter off season is necessary for his health and well-being.

Discontent to accept this suppositions as fact, we set out here to statistically test these questions.

- Do stallions experience a detriment in fertility when standing dual-hemisphere duty?
  - Fertility is defined here as the percentage of live foals reported from mares bred. This data is available only for the Northern Hemisphere, and is dependent on accurate reporting both in terms of number of mares bred and the number of live foals. This figure is not necessarily the same as a medical definition of fertility as measured by veterinarians.
- Are shuttle stallions more likely to die an early death?
  - We studied the age and cause of death for a subset of horses who died at age 19 or younger. We wanted to focus on early causes of death, and attempt to exclude horses who died due to old age to isolate a specific population for in-depth study. The result is 140 stallions, 102 who stood in the Northern Hemisphere only, 38 who shuttled.
- Does shuttling impact a stallion's ability to sire top horses?
  - Percentage of A Runners and G1G2 winners are used to measure performance and compare the subset of shuttle stallions to those who did not shuttle.

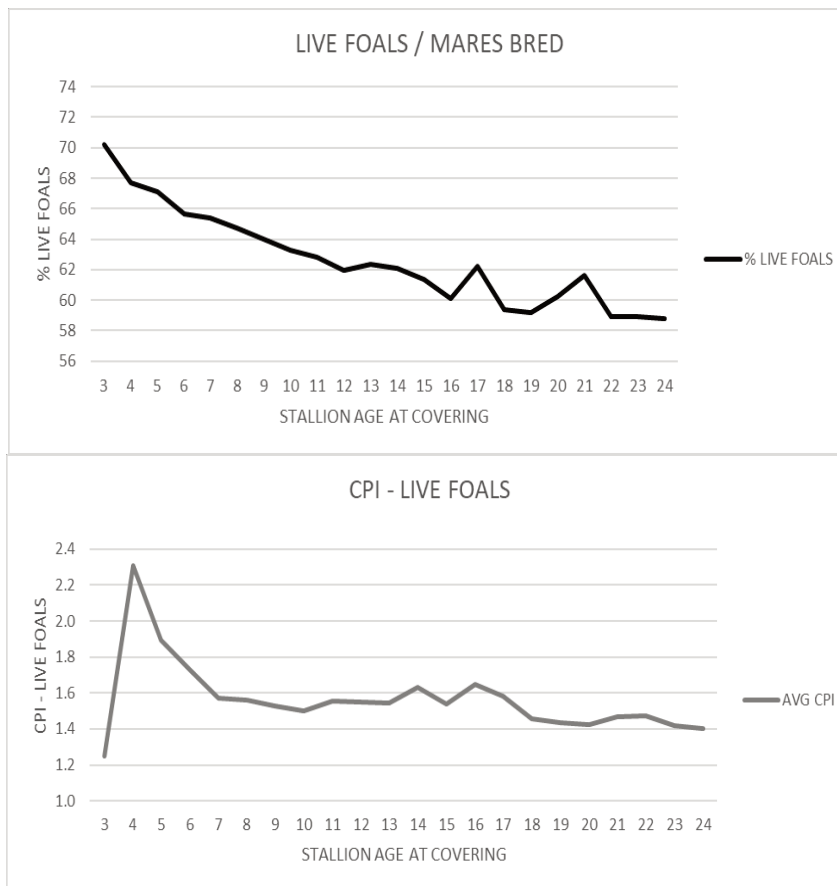
This study was sourced using data from the US Jockey Club and is intended to analyze the population of shuttle stallions versus those stallions who do not shuttle. All efforts were taken to ensure data is an accurate representation, however errors or omissions may occur due to incomplete or inaccurate records.

Our research finds that shuttle stallions do not suffer adverse effects in terms of fertility, mortality, and performance.

## I. FERTILITY- LIVE FOALS AND CPI

### OVERALL FERTILITY STATISTICS: % LIVE FOALS FROM MARES BRED: BY STALLION AGE AT COVERING

First, an overview of stallion fertility and age. This historical data charts the trend in production of live foals from mares bred, along with the overall quality (CPI) of mares bred over time. In general, the percentage of live foals decreases with each year of age, from a high of 70.24% for crops covered by stallions aged 3, to 57.07 for those aged 25, a 16% decrease over time.

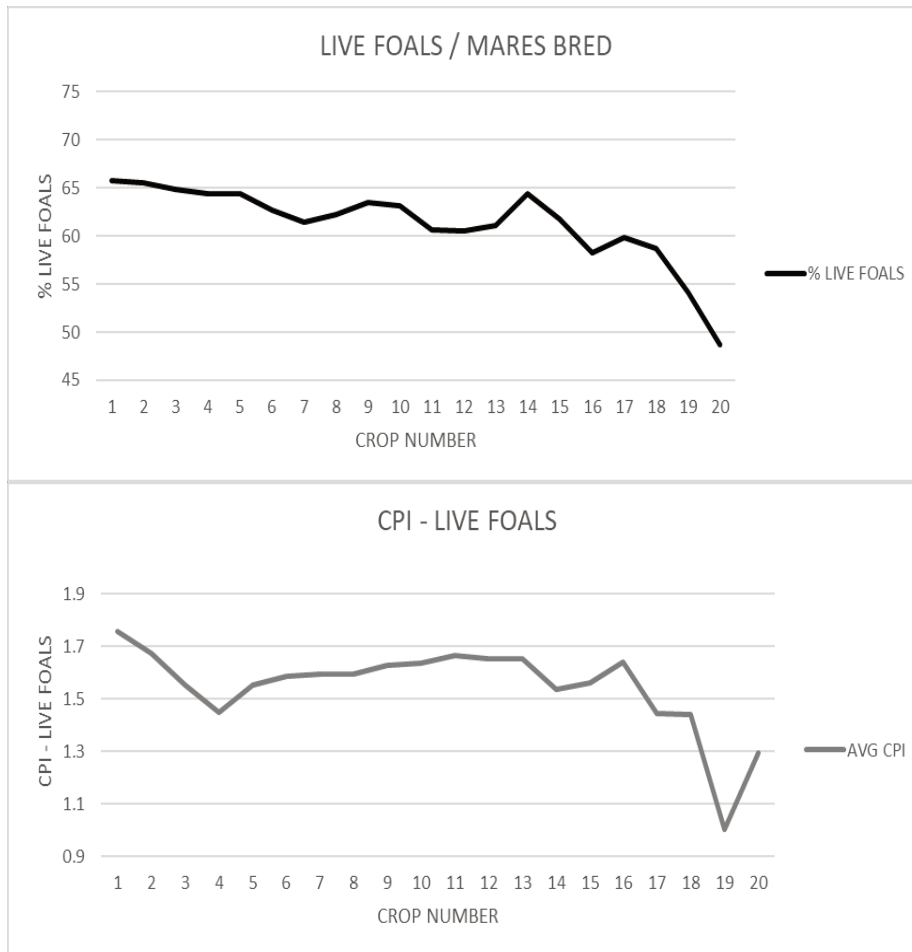


CROP NUMBER	# SIRES	SUM MARES BRED	SUM LIVE FOALS	AVG % LIVE FOALS	AVG CPI
3	6	327	204	70.24	1.25
4	131	11,832	8,212	67.72	2.31
5	308	26,138	17,857	67.11	1.90
6	432	32,461	21,820	65.65	1.73
7	510	34,568	23,038	65.40	1.57
8	529	34,072	22,770	64.75	1.56
9	519	29,346	19,555	63.99	1.53
10	499	26,793	17,720	63.29	1.50
11	449	23,333	15,389	62.80	1.56
12	400	19,706	13,068	61.98	1.55
13	348	17,225	11,436	62.36	1.55
14	279	13,971	9,343	62.12	1.63
15	236	10,461	6,886	61.39	1.54
16	194	8,588	5,735	60.11	1.65
17	152	6,394	4,203	62.23	1.58
18	119	4,850	3,095	59.40	1.46
19	85	2,909	1,875	59.15	1.43
20	62	2,081	1,332	60.27	1.43
21	44	1,289	846	61.60	1.47
22	31	999	645	58.92	1.47
23	21	588	329	58.95	1.42
24	11	214	112	58.81	1.40
<b>TOTAL</b>	<b>5,365</b>	<b>308,145</b>	<b>205,470</b>	<b>63.65</b>	<b>1.60</b>

\*foals covered by sires aged 25+ excluded due to small sample size.

## OVERALL FERTILITY STATISTICS: % LIVE FOALS FROM MARES BRED: BY STALLION CROP NUMBER

Examining the same population of stallions on the preceding page, the graphs and table below detail the percentage live foals and mare CPI by crop number. Although clearly we are dealing with a living being which experiences age just as any other animal does, but the life and time of a Thoroughbred stallion is also governed by the laws of the commercial marketplace whereby his production is measured by crop number. Excluding the dramatic drop in percentage live foals registered for the 20th crop (small sample size), the decline in percentage of live foals remains close to 16%.

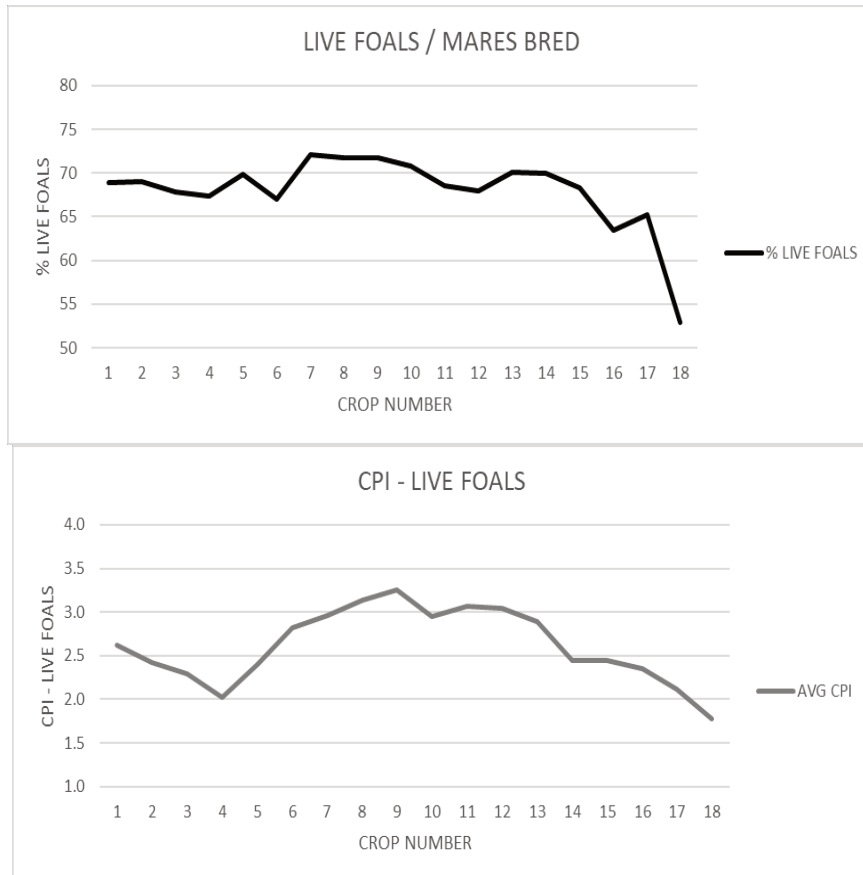


CROP NUMBER	# SIRES	SUM MARES BRED	SUM LIVE FOALS	AVG % LIVE FOALS	AVG CPI
1	546	41,274	27,895	65.79	1.75
2	548	37,049	24,722	65.49	1.68
3	543	32,915	21,942	64.86	1.55
4	538	33,309	22,023	64.41	1.45
5	524	31,550	21,359	64.35	1.55
6	491	25,487	16,790	62.72	1.59
7	421	22,149	14,700	61.42	1.59
8	356	18,908	12,607	62.26	1.59
9	298	15,552	10,489	63.48	1.63
10	250	13,098	8,768	63.18	1.64
11	212	10,474	6,886	60.67	1.66
12	174	8,075	5,330	60.56	1.65
13	134	5,996	3,975	61.11	1.65
14	100	4,356	2,934	64.44	1.54
15	83	3,302	2,170	61.79	1.56
16	60	2,177	1,395	58.30	1.64
17	43	1,427	901	59.79	1.44
18	30	881	509	58.75	1.44
19	15	228	118	54.17	1.00
20	5	44	23	48.73	1.30
TOTAL	5,371	308,251	205,536	63.49	1.60

## II. FERTILITY- LIVE FOALS AND CPI: NH VS SHUTTLE

### OVERALL FERTILITY STATISTICS: % LIVE FOALS FROM MARES BRED: BY STALLION CROP NUMBER

Here we detail the data on a more selected population- just the sample of stallions for which we were able to identify shuttling status and details. The graphs and table below detail the percentage of live foals and dam CPI by crop number. The data distribution for this sample follows a similar general distribution over time as the population detailed on the preceding page, although overall this sample achieves higher live foal rate and average mare quality. This is likely explained by a bias towards information being more readily available on higher quality and/or more commercially popular stallions.

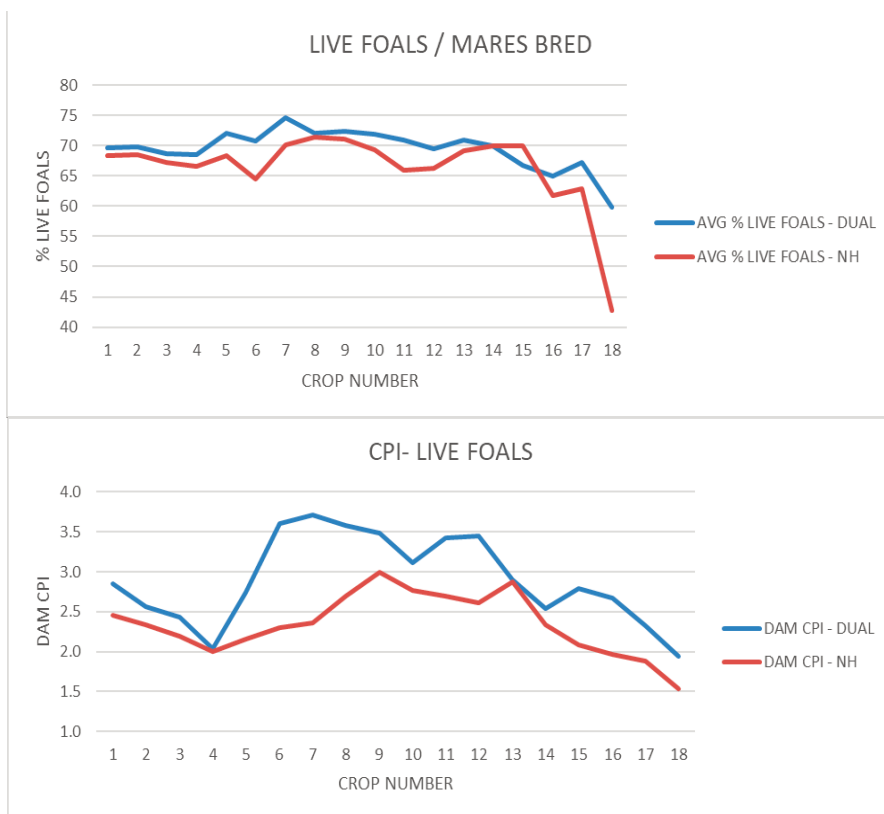


CROP NUMBER	# SIRES	SUM MARES BRED	SUM LIVE FOALS	AVG % LIVE FOALS	AVG CPI
1	98	11,003	7,672	68.91	2.62
2	97	9,407	6,570	69.04	2.43
3	95	8,396	5,827	67.86	2.29
4	96	9,211	6,313	67.36	2.02
5	93	9,863	7,164	69.80	2.39
6	90	9,319	6,518	67.04	2.82
7	74	7,857	5,814	72.16	2.97
8	66	7,116	5,184	71.74	3.14
9	58	6,143	4,531	71.80	3.26
10	54	5,787	4,193	70.75	2.95
11	47	4,716	3,367	68.55	3.07
12	41	3,673	2,613	67.92	3.04
13	33	2,926	2,102	70.05	2.89
14	28	2,278	1,636	70.01	2.45
15	25	1,898	1,350	68.29	2.45
16	20	1,310	887	63.51	2.35
17	13	820	556	65.23	2.12
18	10	518	289	52.96	1.78
TOTAL	1,038	102,286	72,606	68.90	2.64

### NH VS DUAL FERTILITY STATISTICS: % LIVE FOALS FROM MARES BRED: BY STALLION CROP NUMBER

The group of shuttle sires actually has a higher rate of live foals/mares bred, with the shuttle sires achieving an overall rate of 69.48% live foals from 52,970 mares bred, versus 66.36% from 49,271 bred for the horses who stood in only one hemisphere. Likewise, the average CPI for all crops for all sires who stood in both hemispheres is 2.90, compared to 2.35 for the non-shuttle sires.

Keep in mind that there is certainly a selection bias at work- the sires selected for dual-hemisphere duty were not done so at random- it is likely that the horses selected for shuttling are overall a more commercially desirable group. One piece of evidence for this hypothesis is found in the comparison of the average CPI for the two groups- a higher CPI indicates better quality mares. It is possible that the more desirable sires, with their more desirable mates, achieved the higher percentage of live foals due to better veterinary care or overall more diligence on the part of the breeder toward achieving a live foal. In any case, the differences between the two groups are very small, and it appears that the shuttle sires are not receiving a penalty in terms of percentage of live foals produced.



DUAL HEMISPHERE SIRES

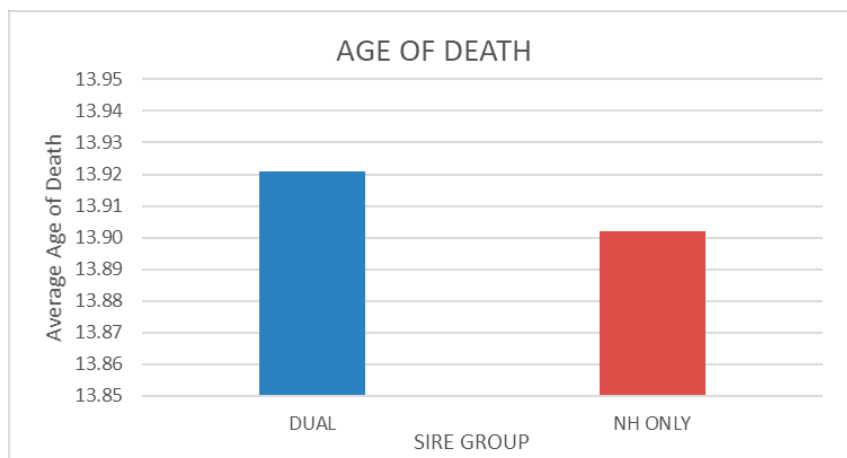
CROP #	# SIRES	SUM MARES BRED	SUM LIVE FOALS	AVG % LIVE FOALS - DUAL	% FOALS AS % OF TOTAL	AVG CPI	DAM CPI - DUAL AS % OF TOTAL
1	40	4,975	3,520	69.63	101.04	2.85	108.75
2	39	4,374	3,085	69.86	101.17	2.56	105.41
3	39	3,860	2,691	68.66	101.17	2.44	106.24
4	39	4,528	3,100	68.48	101.65	2.04	100.97
5	37	4,920	3,651	72.04	103.22	2.74	114.64
6	36	4,706	3,404	70.84	105.66	3.60	127.66
7	33	4,148	3,118	74.64	103.44	3.72	125.29
8	33	3,931	2,853	72.07	100.47	3.58	114.11
9	31	3,600	2,644	72.34	100.76	3.48	106.96
10	29	3,325	2,418	71.92	101.64	3.11	105.39
11	24	2,705	1,954	70.98	103.55	3.43	111.80
12	21	2,175	1,550	69.50	102.33	3.45	113.55
13	17	1,578	1,130	70.94	101.26	2.90	100.40
14	16	1,333	960	70.00	99.98	2.53	103.43
15	13	1,013	728	66.74	97.74	2.79	113.85
16	11	828	556	64.93	102.23	2.67	113.42
17	7	569	391	67.26	103.12	2.32	109.42
18	6	402	225	59.82	112.95	1.94	109.23
TOTAL	471	52,970	37,978	69.48	102.41	2.90	110.58

NOTHERN HEMIPHSERE ONLY SIRES

CROP #	# SIRES	SUM MARES BRED	SUM LIVE FOALS	AVG % LIVE FOALS - NH	% FOALS AS % OF TOTAL	AVG CPI	DAM CPI - NH AS % OF TOTAL
1	58	6,028	4,152	68.42	99.29	2.46	93.97
2	58	5,033	3,485	68.50	99.21	2.34	96.36
3	56	4,536	3,136	67.31	99.19	2.19	95.66
4	57	4,683	3,213	66.60	98.87	2.01	99.33
5	56	4,943	3,513	68.31	97.87	2.16	90.33
6	54	4,613	3,114	64.51	96.22	2.30	81.56
7	41	3,709	2,696	70.17	97.23	2.36	79.64
8	33	3,185	2,331	71.40	99.53	2.70	85.89
9	27	2,543	1,887	71.17	99.13	3.00	92.00
10	25	2,462	1,775	69.40	98.09	2.76	93.75
11	23	2,011	1,413	66.01	96.30	2.69	87.69
12	20	1,498	1,063	66.26	97.55	2.61	85.77
13	16	1,348	972	69.11	98.66	2.88	99.58
14	12	945	676	70.04	100.03	2.34	95.42
15	12	885	622	69.95	102.44	2.08	85.00
16	9	482	331	61.78	97.28	1.97	83.60
17	6	251	165	62.85	96.36	1.89	89.01
18	4	116	64	42.70	80.57	1.53	86.16
TOTAL	567	49,271	34,608	66.36	97.44	2.35	90.04

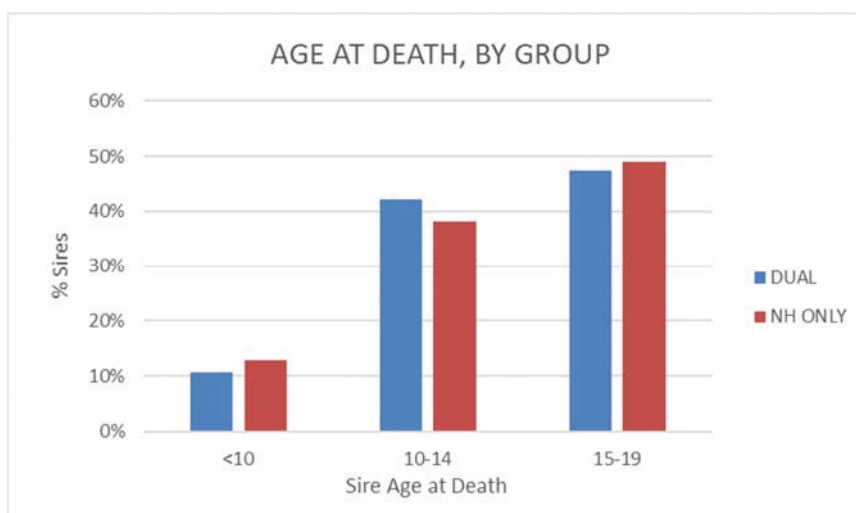
### III. MORTALITY

Investigating the relationship between shuttling and mortality required a qualitative search to identify the specific time and reason attributed for a stallion's death. Using a subset of the sire population in our data identified as horses who potentially died or ended their career early (those with <20 total crops sired), we attempted to determine the year and cause of death for 227 sires. Sires who died at age 20 or greater were excluded, leaving us with a sample of 140 (61%) who were confirmed as deceased on a specific day/year, and 105 (75%) of those with a published cause of death.



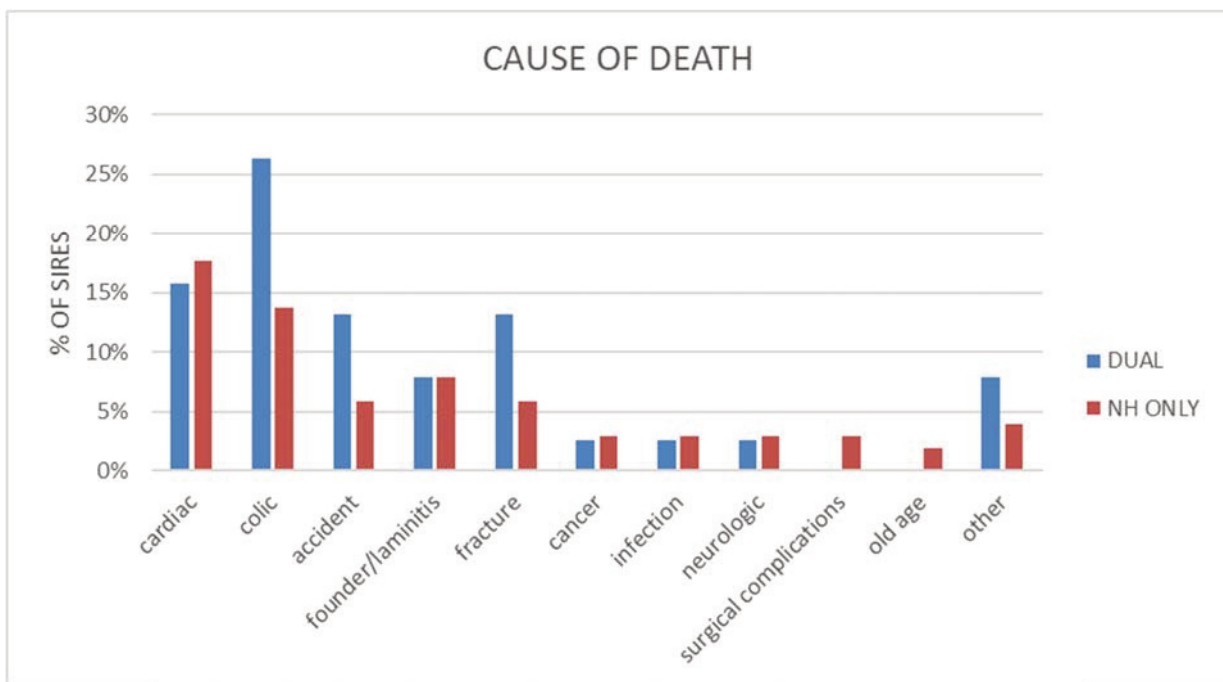
SIRE GROUP	# OF SIRES	AVG AGE @ DEATH
DUAL	38	13.92
NH ONLY	102	13.90
<b>TOTAL</b>	<b>140</b>	<b>13.91</b>

Comparing the average age of death for the two groups, we find that the Dual-Hemisphere sires actually have a slightly higher average age at death- 13.92 years versus 13.90 years for those who stood in the Northern Hemisphere only. A statistical test to compare the means reveals no significant differences between the groups. Keep in mind that the average age here is not intended to be representative of the population as a whole- this research on cause of death was restricted to only those sires who died under age 20 in order to filter out as many 'natural', or old-age related deaths as possible.



SIRE AGE AT DEATH							
SIRE GROUP	<10	%	10-14	%	15-19	%	TOTAL
DUAL	4	10.53	16	42.11	18	47.37	38
NH ONLY	13	12.75	39	38.24	50	49.02	102
<b>TOTAL</b>	<b>17</b>	<b>12.14</b>	<b>55</b>	<b>39.29</b>	<b>68</b>	<b>48.57</b>	<b>140</b>

Separating the sires by group at age of death again reveals no statistically significant differences between the groups.



CAUSE OF DEATH	DUAL	%	NH ONLY	%	TOTAL
cardiac	6	15.79%	18	17.65%	<b>24</b>
colic / abdominal*	10	26.32%	14	13.73%	<b>24</b>
accident	5	13.16%	6	5.88%	<b>11</b>
founder/laminitis	3	7.89%	8	7.84%	<b>11</b>
fracture	5	13.16%	6	5.88%	<b>11</b>
cancer	1	2.63%	3	2.94%	<b>4</b>
infection	1	2.63%	3	2.94%	<b>4</b>
neurologic	1	2.63%	3	2.94%	<b>4</b>
surgical complications	-	-	3	2.94%	<b>3</b>
old age	-	-	2	1.96%	<b>2</b>
other	3	7.89%	4	3.92%	<b>7</b>
unknown	3	7.89%	32	31.37%	<b>35</b>
<b>TOTAL</b>	<b>38</b>		<b>102</b>		<b>140</b>

The chart and table above show the cause of death for the sample of stallions. It was possible to identify cause of death for 105 stallions. Cardiac events and colic / abdominal problems were responsible for 24 deaths each, for a combined total of just over 45% of the total identified deaths. Accidents, hoof problems (laminitis/founder), and fractures each claimed 11 lives, and those five primary sources combined make up 77% of the identified deaths.

The only category where a statistically significant difference was found between the groups was for deaths identified as colic, or other abdominal-related maladies. Accidental deaths and fractures were also higher among the Dual-Hemisphere group, although due to the small sample size the difference is not statistically significant. Note that the categorization was based on published death reports, and in some cases multiple causes could be attributed to a death – for example in cases where colic or laminitis resulted in death after surgery or other illness it is sometimes unclear if the listed cause of death was the side-effect of some other malady. Caution should be used when interpreting this data as many of the categories have very small sample sizes and many deaths have multiple causes contributing to the end result.

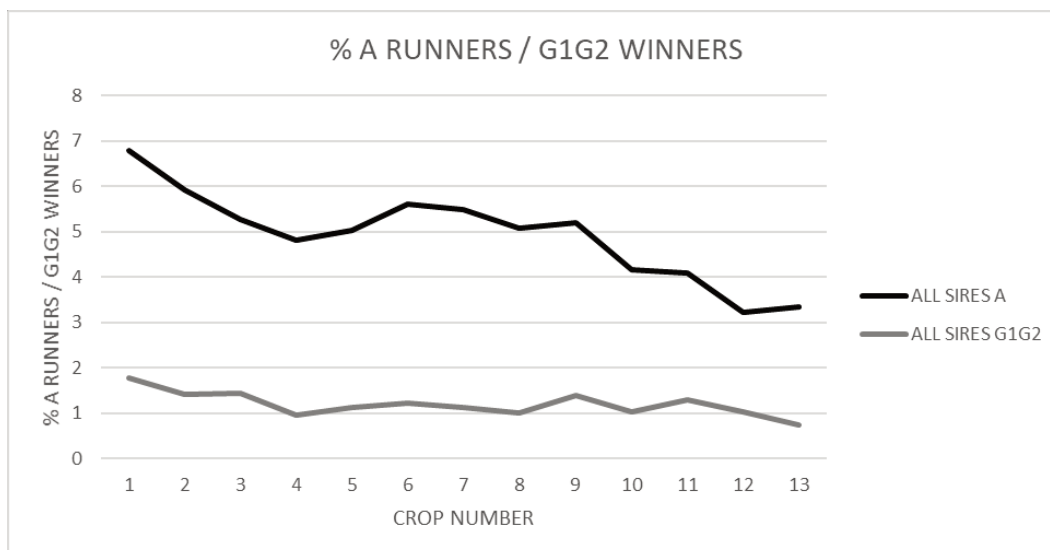


## IV. PERFORMANCE

### OVERALL PERFORMANCE STATISTICS: %A RUNNERS AND G1G2 WINNERS: BY STALLION CROP NUMBER

Using only those sires who we have complete data for (mares bred data is not available before 1996) we arrived at a population from which to study this phenomenon. First, data on the performance of these shuttle sires- the table below details the performance statistics for our sample of sires, which ranges from a high sample of 98 sires with first-crop data to 18 sires who have 13th crop data. Data beyond the 13th crop is excluded here due to low sample size.

Overall, sires have their most successful crops early, with a general performance decline over time. The metrics used here are percentage of A Runners and G1G2 winners. Over time, a stallion's production of A Runners declines rather dramatically, and while the production of G1G2 winners also declines, it does not plummet as drastically as the percentage of A Runners.



CROP NUMBER	# SIREs	SUM LIVE FOALS	SUM # A RNRS	AVG %A / LIVE FOALS	SUM # G1G2 WNRS	AVG %G1G2 / LIVE FOALS	AVG CPI	AVG CPI DAMS A RNRS
1	98	7,672	533	6.79	151	1.77	2.62	4.17
2	81	5,646	364	5.93	96	1.42	2.55	4.19
3	78	4,764	270	5.26	74	1.43	2.43	3.01
4	68	4,616	246	4.81	50	0.95	2.19	4.83
5	58	4,834	287	5.03	66	1.13	2.63	3.68
6	48	4,085	252	5.62	59	1.22	3.30	4.55
7	45	3,905	227	5.49	49	1.13	3.30	4.62
8	36	2,907	147	5.09	32	1.01	3.16	4.22
9	33	2,662	143	5.20	43	1.39	3.23	4.31
10	30	2,359	104	4.16	28	1.03	2.76	2.44
11	26	2,126	90	4.09	27	1.28	3.24	4.26
12	18	1,320	46	3.22	15	1.04	3.15	4.33
13	18	1,271	48	3.34	12	0.74	3.11	5.00
TOTAL	637	48,167	2,757	4.92	702	1.19	2.90	4.12

### NH VS DUAL PERFORMANCE STATISTICS: %A RUNNERS AND G1G2 WINNERS: BY STALLION CROP NUMBER

As demonstrated in the graphs tables below, we split the sample into two groups- those sires who stood in both the Northern and Southern Hemisphere, and those who stood only in the Northern Hemisphere. As you can see, there's very little to distinguish the two groups, with each having similar rates of A Runners and G1G2 winners, and in fact the sires who stood in both hemispheres actually had slightly higher overall rates of A Runners and G1G2 winners- likely a reflection of the fact that higher-quality/more commercially desirable stallions are selected for dual-hemisphere duty. In this sample, we find no evidence of a penalty in terms of performance for shuttle sires.



#### DUAL HEMISPHERE SIRES

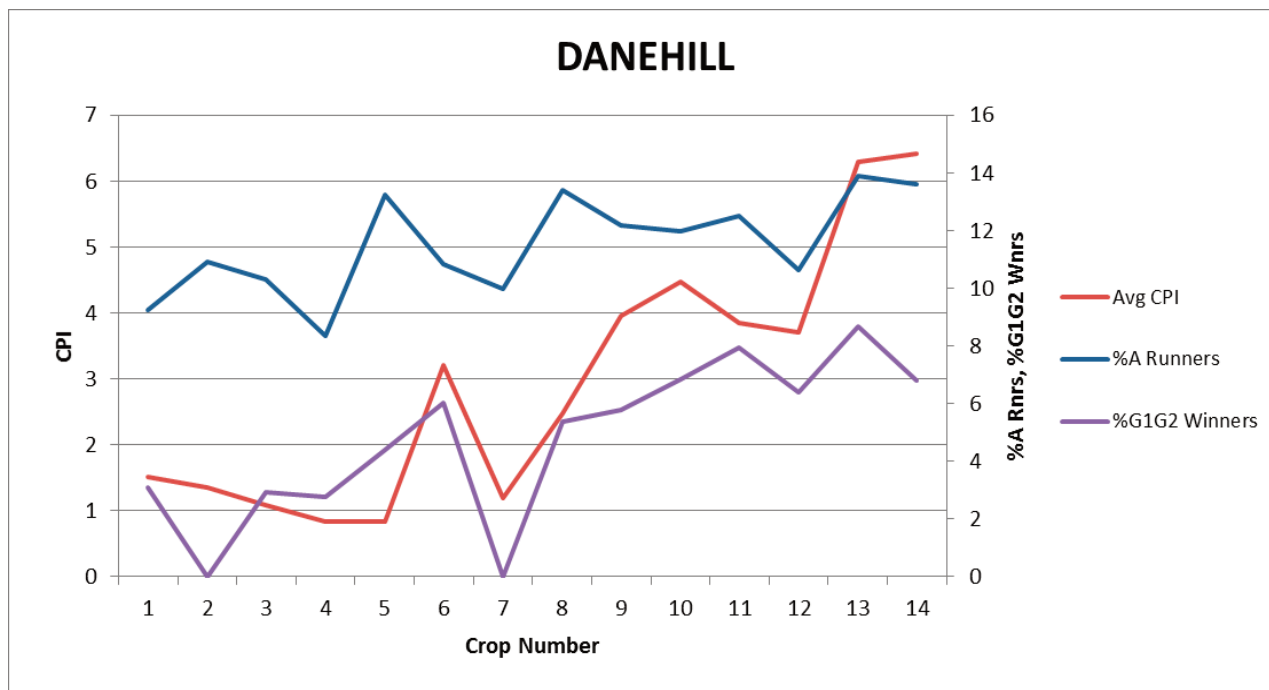
CROP #	# SIRES	SUM LIVE FOALS	SUM #A RNRS	% A - DUAL	SUM # G1G2 WNRS	AVG %G1G2 / LIVE FOALS	AVG CPI	AVG CPI DAMS A RNRS
1	40	3,520	251	7.28	73	2.00	2.85	4.33
2	36	2,851	214	7.40	58	1.70	2.61	3.52
3	36	2,440	114	4.51	32	1.22	2.48	2.17
4	31	2,500	151	5.76	23	0.83	2.13	4.55
5	27	2,776	182	6.15	44	1.44	2.93	4.27
6	23	2,392	136	5.15	33	1.28	3.83	5.47
7	24	2,414	148	6.03	27	1.07	4.03	4.96
8	21	1,783	97	5.55	22	1.13	3.78	5.77
9	19	1,638	85	4.88	25	1.31	3.64	3.18
10	16	1,330	57	4.12	17	1.20	3.07	2.51
11	14	1,326	53	3.98	16	1.23	3.65	5.31
12	9	787	27	3.32	9	1.06	3.65	4.67
13	9	739	28	3.64	9	1.05	3.17	3.92
TOTAL	305	26,496	1,543	5.21	388	1.27	3.22	4.20

#### NH ONLY SIRES

CROP #	# SIRES	SUM LIVE FOALS	SUM #A RNRS	% A - NH	SUM # G1G2 WNRS	AVG %G1G2 / LIVE FOALS	AVG CPI	AVG CPI DAMS A RNRS
1	58	4,152	282	6.45	78	1.62	2.46	4.02
2	45	2,795	150	4.75	38	1.20	2.49	4.96
3	42	2,324	156	5.91	42	1.61	2.38	3.85
4	37	2,116	95	4.02	27	1.06	2.25	5.07
5	31	2,058	105	4.07	22	0.86	2.37	2.96
6	25	1,693	116	6.05	26	1.16	2.81	2.98
7	21	1,491	79	4.88	22	1.19	2.46	4.09
8	15	1,124	50	4.43	10	0.84	2.29	2.27
9	14	1,024	58	5.64	18	1.49	2.69	5.93
10	14	1,029	47	4.19	11	0.83	2.41	2.34
11	12	800	37	4.21	11	1.33	2.77	2.61
12	9	533	19	3.12	6	1.01	2.65	3.76
13	9	532	20	3.04	3	0.43	3.04	7.70
TOTAL	332	21,671	1,214	4.67	314	1.13	2.54	4.04

## V. SAMPLE DETAIL- SELECTED SHUTTLE SIRES

The following stallions were selected as examples of stallions who stood at stud in both hemispheres. Note that the data below includes only the Northern Hemisphere statistics

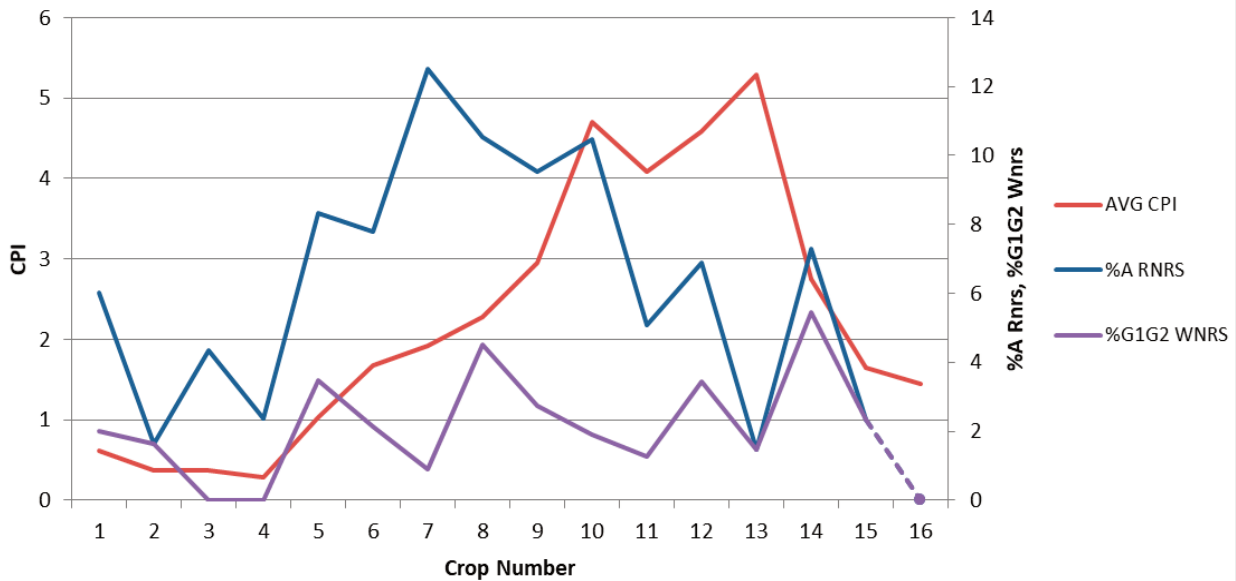


Crop Number	Foal YOB	# FOALS	# A RNRS	%A RNRS	# G1G2 WNRS	% G1G2 WNRS	Avg CPI, dams all foals
1	1991*	65	6	9.23	2	3.08	1.51
2	1992*	64	7	10.94	-	-	1.35
3	1993*	68	7	10.29	2	2.94	1.08
4	1994*	72	6	8.33	2	2.78	0.84
5	1995*	68	9	13.24	3	4.41	0.85
6	1996*	83	9	10.84	5	6.02	3.20
7	1997*	90	9	10.00	-	-	1.19
8	1998*	112	15	13.39	6	5.36	2.48
9	1999*	156	19	12.18	9	5.77	3.96
10	2000*	117	14	11.97	8	6.84	4.48
11	2001*	88	11	12.50	7	7.95	3.84
12	2002*	94	10	10.64	6	6.38	3.71
13	2003	115	16	13.91	10	8.70	6.30
14	2004	103	14	13.59	7	6.80	6.41
<b>TOTAL 3YO+</b>	14	1295	152	11.74%	67	5.17%	3.27
<b>DANEHILL 1986 – 2003 (DANZIG X HIS MAJESTY)</b>							

\*denotes year also served in Southern Hemisphere

Danehill shuttled nearly every year of his sire career. He stood in the northern hemisphere at Coolmore Ireland, and although he started at Arrowfield in Australia he moved to Coolmore's southern hemisphere base for the 1995 breeding season. He was champion sire in both hemispheres on multiple occasions, earning titles in Australia, Great Britain, Ireland, and France. He broke his hip at Coolmore in a paddock accident and was euthanized on May 13, 2003, when he was 17 years old.

## DANEHILL DANCER

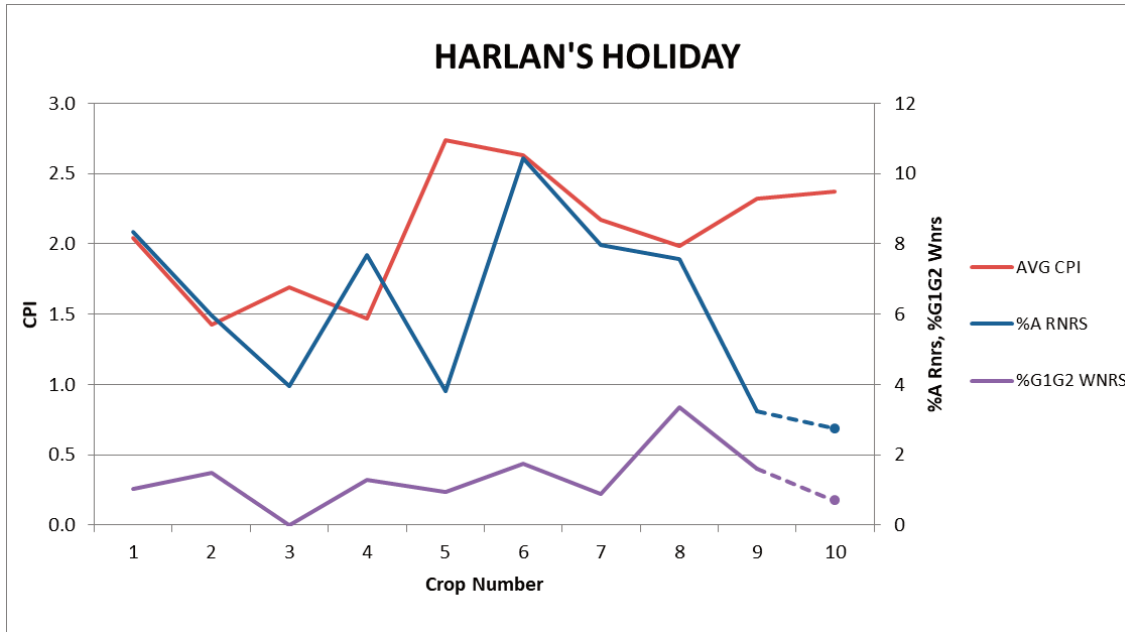


Crop Number	Foal YOB	Stud Fee	# FOALS	# A RNRS	%A RNRS	# G1G2 WNRS	% G1G2 WNRS	Avg CPI, dams all foals	Avg CPI, dams A RNRS	Yearling Average
1	1999*	\$5,000	100	6	6.00	2	2.00	0.62	0.73	37,754
2	2000*	\$5,000	61	1	1.64	1	1.64	0.37	-	66,078
3	2001*	\$3,500	69	3	4.35	-	-	0.37	-	65,522
4	2002*	\$3,500	84	2	2.38	-	-	0.28	-	57,367
5	2003*	\$9,000	144	12	8.33	5	3.47	1.04	1.73	70,783
6	2004*	\$30,000	141	11	7.80	3	2.13	1.67	1.78	137,099
7	2005*	\$45,000	112	14	12.50	1	0.89	1.92	1.80	157,705
8	2006*	\$40,000	133	14	10.53	6	4.51	2.27	3.88	186,748
9	2007*	\$115,000	147	14	9.52	4	2.72	2.95	3.97	188,792
10	2008	\$115,000	105	11	10.48	2	1.90	4.70	12.74	163,177
11	2009*	\$115,000	79	4	5.06	1	1.27	4.08	6.35	182,617
12	2010*	\$100,000	116	8	6.90	4	3.45	4.59	5.10	157,223
13	2011	\$85,000	68	1	1.47	1	1.47	5.29	1.10	129,973
14	2012	\$75,000	55	4	7.27	3	5.45	2.76	11.10	178,749
15	2013	\$60,000	43	1	2.33	1	2.33	1.65	2.70	140,955
16	2014	\$40,000	9	-	-	-	-	1.45	-	105,174
<b>TOTAL 3YO+</b>	<b>16</b>	<b>\$133,056</b>	<b>1466</b>	<b>106</b>	<b>7.23%</b>	<b>34</b>	<b>2.32%</b>	<b>2.33</b>	<b>3.48</b>	<b>\$131,240</b>

DANEHILL DANCER 1993 - 2017 (DANEHILL x SHARPEN UP)

\*denotes year also served in Southern Hemisphere

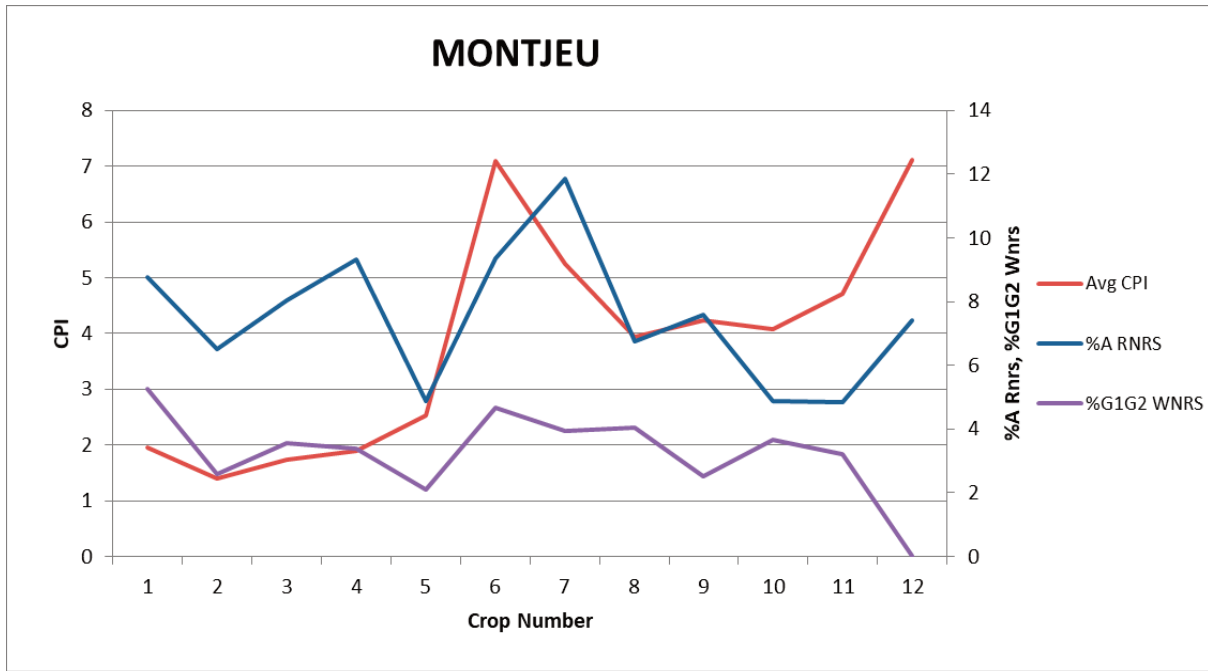
With the success his sire had in shuttling both hemipsheres, it's no surprise to find Danehill Dancer took service on both sides of the equator. After just one start in the spring of his four-year-old year, he was retired to stand his first season in 1997 at Coolmore Australia, before heading to Coolmore Ireland in 1998. He was champion sire in Great Britain and Ireland in 2009. Danehill Dancer was retired after the 2013 breeding season, and was euthanized at age 24 on March 12, 2017 due to the infirmities of his years.



Crop Number	Foal YOB	Stud Fee	# FOALS	# A RNRS	%A RNRS	# G1G2 WNRS	% G1G2 WNRS	Avg CPI, dams all foals	Avg CPI, dams A RNRS	Yearling Average
1	2005	\$17,500	96	8	8.33	1	1.04	2.04	2.70	95,584
2	2006	\$17,500	67	4	5.97	1	1.49	1.43	5.55	96,676
3	2007	\$17,500	76	3	3.95	-	-	1.69	1.91	92,162
4	2008	\$25,000	78	6	7.69	1	1.28	1.47	2.44	68,919
5	2009	\$30,000	105	4	3.81	1	0.95	2.74	6.16	66,555
6	2010	\$30,000	115	12	10.43	2	1.74	2.63	2.34	56,319
7	2011*	\$25,000	113	9	7.96	1	0.88	2.17	1.91	87,745
8	2012*	\$25,000	119	9	7.56	4	3.36	1.99	2.61	106,993
9	2013	\$25,000	124	4	3.23	2	1.61	2.32	4.13	163,782
10	2014*	\$35,000	146	4	2.74	1	0.68	2.37	4.53	158,056
<b>TOTAL 3YO+</b>	<b>10</b>	<b>\$25,721</b>	<b>1039</b>	<b>63</b>	<b>6.06%</b>	<b>14</b>	<b>1.35%</b>	<b>2.16</b>	<b>3.45</b>	<b>\$103,495</b>
<b>HARLAN'S HOLIDAY 1999 - 2013 (HARLAN x AFFIRMED)</b>										

\*denotes year also served in Southern Hemisphere

Harlan's Holiday began his stud career in 2004 at Airdrie Stud. In late 2010 he moved to Winstar farm, siring his first foals there in the spring of 2011. That year, he also began shuttling to Haras La Mission in Argentina, where he stood three seasons. He was suffered a catastrophic intestinal prolapse on November 1, 2013 while in Argentina and was euthanized at age 14.

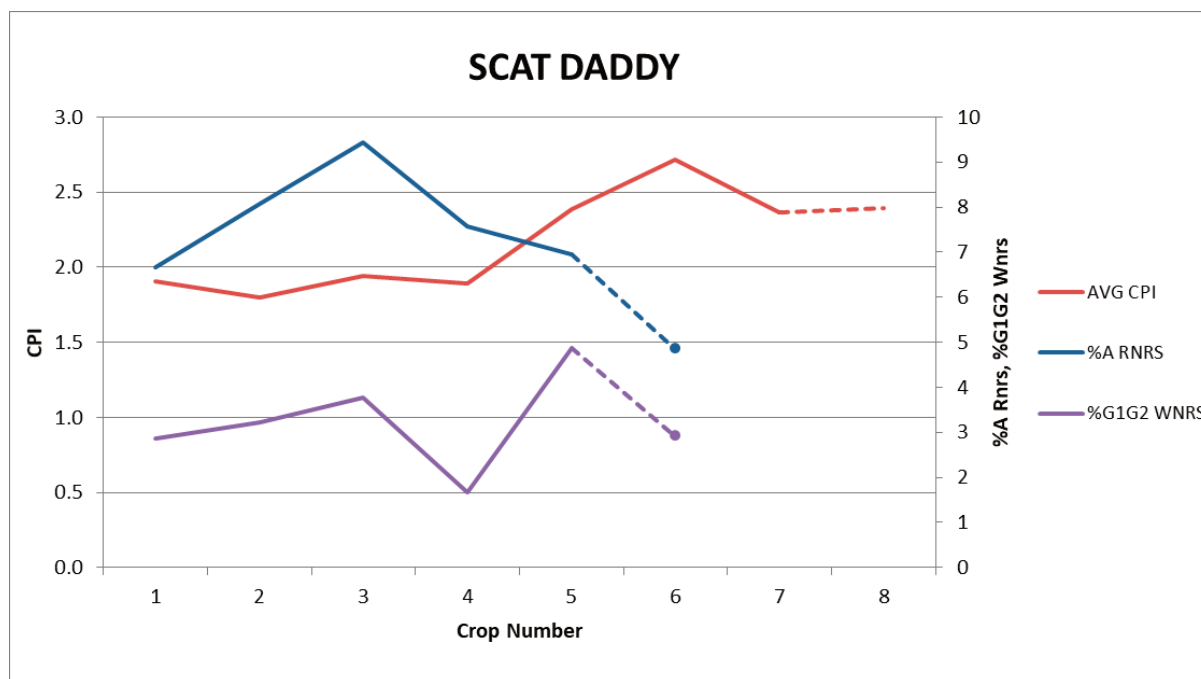


Crop Number	Foal YOY	Stud Fee	# FOALS	# A RNRs	%A RNRs	# G1G2 WNRS	% G1G2 WNRS	Avg CPI, dams all foals	Avg CPI, dams A RNRs	Yearling Average
1	2002*	31,500	114	10	8.77	6	5.26	1.96	5.09	161,431
2	2003*	27,500	77	5	6.49	2	2.60	1.39	0.42	160,542
3	2004*	30,000	112	9	8.04	4	3.57	1.74	5.04	248,350
4	2005*	30,000	118	11	9.32	4	3.39	1.90	3.46	148,719
5	2006	45,000	144	7	4.86	3	2.08	2.52	4.97	208,962
6	2007	125,000	107	10	9.35	5	4.67	7.09	3.82	341,169
7	2008	125,000	76	9	11.84	3	3.95	5.25	8.79	242,977
8	2009	110,000	74	5	6.76	3	4.05	3.94	9.16	199,947
9	2010	100,000	79	6	7.59	2	2.53	4.23	7.29	283,936
10	2011	100,000	82	4	4.88	3	3.66	4.08	2.73	354,603
11	2012	75,000	62	3	4.84	2	3.23	4.71	19.40	595,878
12	2013	100,000	27	2	7.41	-	-	7.11	12.25	511,720
TOTAL 3YO+	12	\$68,613	1072	81	7.56%	37	3.45%	3.46	5.96	\$259,567

MONTJEU 1996 - 2012 (SADLER'S WELLS x TOPVILLE)

\*denotes year also served in Southern Hemisphere

Montjeu shuttled between Coolmore Ireland and Windsor Park Stud in New Zealand for each of his first four years, but 2004 was his last year in the Southern Hemisphere. He died at age 16 on March 26, 2012 from complications related to septicemia.

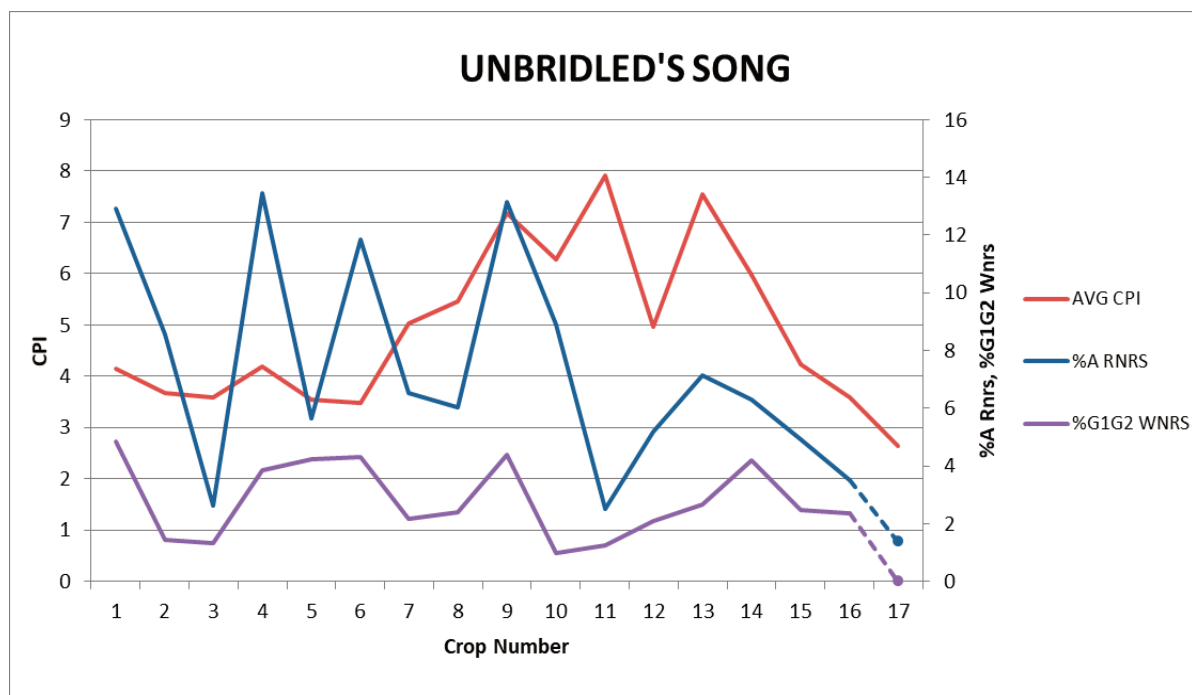


Crop Number	Foal YOB	Stud Fee	# FOALS	# A RNRs	%A RNRs	# G1G2 WNRS	% G1G2 WNRS	Avg CPI, dams all foals	Avg CPI, dams A RNRs	Yearling Average
1	2009*	\$30,000	105	7	6.67	3	2.86	1.91	2.09	52,285
2	2010*	\$22,500	62	5	8.06	2	3.23	1.80	1.50	44,051
3	2011*	\$15,000	53	5	9.43	2	3.77	1.94	2.25	77,058
4	2012	\$10,000	119	9	7.56	2	1.68	1.89	1.80	83,961
5	2013	\$17,500	144	10	6.94	7	4.86	2.39	3.99	122,560
6	2014	\$30,000	103	5	4.85	3	2.91	2.71	5.80	195,515
7	2015	\$30,000	155	8	5.16	3	1.94	2.37	2.23	243,158
8	2016	\$35,000	158	-	-	-	-	2.40	-	318,195
<b>TOTAL 3YO+</b>	<b>6</b>	<b>\$22,659</b>	<b>741</b>	<b>49</b>	<b>6.61%</b>	<b>22</b>	<b>2.97%</b>	<b>2.20</b>	<b>2.92</b>	<b>\$131,947</b>

**SCAT DADDY 2004 - 2015 (JOHANNESBURG x MR. PROSPECTOR)**

\*denotes year also served in Southern Hemisphere

Standing at Ashford Stud in Kentucky, Scat Daddy also stood at Haras Paso Nevado in Chile for his first three years. He was champion sire in Chile in 2013, 2014, and 2015. Scat Daddy died at age 11 from cardiac collapse on December 14, 2015.



Crop Number	Foal YOB	Stud Fee	# FOALS	# A RNRS	%A RNRS	# G1G2 WNRS	% G1G2 WNRS	Avg CPI, dams all foals	Avg CPI, dams A RNRS	Yearling Average
1	1998*	\$40,000	62	8	12.90	3	4.84	4.14	3.80	254,900
2	1999*	\$40,000	70	6	8.57	1	1.43	3.68	3.94	277,718
3	2000*	\$40,000	76	2	2.63	1	1.32	3.58	11.25	231,553
4	2001	\$40,000	104	14	13.46	4	3.85	4.18	4.54	258,251
5	2002	\$40,000	71	4	5.63	3	4.23	3.54	2.19	272,188
6	2003	\$75,000	93	11	11.83	4	4.30	3.49	8.92	370,698
7	2004	\$100,000	92	6	6.52	2	2.17	5.03	13.83	399,149
8	2005	\$125,000	83	5	6.02	2	2.41	5.47	7.01	421,465
9	2006	\$125,000	114	15	13.16	5	4.39	7.18	9.43	423,190
10	2007	\$200,000	101	9	8.91	1	0.99	6.29	9.45	350,156
11	2008	\$150,000	79	2	2.53	1	1.27	7.90	3.82	323,833
12	2009	\$125,000	96	5	5.21	2	2.08	4.95	5.60	180,580
13	2010	\$125,000	112	8	7.14	3	2.68	7.55	12.05	225,741
14	2011	\$100,000	95	6	6.32	4	4.21	5.98	7.32	192,750
15	2012	\$85,000	81	4	4.94	2	2.47	4.23	9.38	199,260
16	2013	\$85,000	85	3	3.53	2	2.35	3.59	17.60	226,518
17	2014	\$60,000	73	1	1.37	-	-	2.64	0.60	243,725
<b>TOTAL 3YO+</b>	17	\$95,602	1487	109	7.33%	40	2.69%	5.06	8.00	\$288,172

UNBRIDLED'S SONG 1993-2013 (UNBRIDLED x CARO)

\*denotes year also served in Southern Hemisphere

Unbridled's Song divided his time between Taylor Made in Kentucky and Arrowfield, Australia for his first three years at stud. He was euthanized on July 26, 2013 at age 20 due to acute neurological symptoms attributed to a large mass in his sinus cavity.