<u>Hatchability of the Modern Exhibition Budgerigar</u>

By Ken Yorke (2011)

Being competitive with exhibition budgerigars is about managing quality of bird. Quality generally relates to managing traits, bloodlines and the skill of pair selection. Even the most consistent bloodline of quality pairs will produce a range of differing quality chicks, as can be expected by genetic variability. Despite all the skill of the breeder we are still bound by some degree of probability and statistics which means that in order to maximise the number of good quality offspring that a pair can produce then we need to maximise the total number of chicks produced from any particular pair.

In simple terms, if a pair of birds produces 4 chicks (2 good and 2 poor) in a clutch, then at the end of the season you will have 2 good birds to show and breed with next season. If the same pair instead produces 6 chicks (3 good and 3 poor) then you now have 3 good birds to show and breed with instead of 2. The more birds you breed then, on average, the more good birds you have to select from for showing and future breeding. The point of this simple theoretical exercise is to show that in order to manage quality of birds it is also advantageous to maximise quantity.

To breed more birds you could i) buy more pairs and increase the number of breeding cages, or ii) increase the number of clutches from existing pairs or iii) improve the reproductive ability of existing pairs. Option i) above is expensive, option ii) causes more wear and tear on birds and may even shorten their breeding life. This article will address option iii), maximising quantity through examining hatchability of the modern exhibition budgerigar.

In the last few decades, many theories and anecdotes abound about the perceived drop off in fertility of the exhibition budgerigar brought about perhaps by inbreeding and/or increased feather length interfering with the physical act of mating. However, very little factual evidence exists to confirm or deny such claims.

In order to establish some benchmarks I extracted some data from my own breeding records.

Table 1	
No of eggs	12,830
No of years	21
% eggs hatched (Hatchability)	Yearly Average 38% (Std Dev +/- 7%)
% hatchlings survive (Rearability)	Yearly Average 70% (Std Dev +/- 9%)

This means that for every 100 eggs laid, 38 chicks will hatch and of these chicks, 27 will survive. These numbers may seem small but the truth is that few people ever measure such statistics and would probably be surprised to get similar results if they did.

True egg fertility is difficult to measure without scientific instruments as some fertile eggs die at such an early stage they appear clear. Hatchability, on the other hand, is very easy to measure, eggs either hatch or they don’t.

In a smaller sample of data (2,009 eggs) where an attempt was made to examine the cause of non-hatching eggs, the following approximate data was realised.

Table 2	
Clear	44%
Broken/Damaged	8%
Addled/Dead in Shell	10%
Hatched	38%

The data in Table 2 should be regarded as approximate only, with the true percentage of clear eggs probably being lower and the addled/dead in shell being higher.

For eggs to hatch they must first be fertilised. Infertile (clear) eggs can have two main causes with numerous possible sub-causes such as, but not limited to:-

i) Temporary or permanent sterility (including reduced fertility) due to

- a) Old age
- b) Illness
- c) Moult
- d) Out of condition
- e) Stress

ii) Failure to mate due to

- a) Breeding cage deficiencies
- b) Excess feathering
- c) Lack of libido
- d) Physical disability

Age

The same raw data used to construct Table 1 was also analysed to assess the effect of parent age on hatchability. This is shown in Table 3.

Table 3							
Age (years)	0-1	1-2	2-3	3-4	4-5	5-6	6-7
Cock Hatchability	35%	39%	38%	38%	37%	33%	20%
Hen Hatchability	35%	40%	37%	36%	28%	37%	0%*

(* Small sample of data)

Surprisingly there is no dramatic drop off in hatchability until the age is 6 to 7 years. A very slight peak appears in the 1-2 year age group but this is minimal.

Breeding Season

Unlike most breeders, I allow my birds to breed at any time of year, i.e. I do not have a defined breeding season. I have birds breeding twelve months a year. All the above data reflects this 12 month a year breeding time. Many years ago I colony bred and again allowed the birds to breed any time they liked in a twelve month period. In the colony system it was obvious that the birds willingness to breed was always much higher in spring than any other time. But that is not to say that those birds that did choose to breed outside spring bred poorly. Is there a best time of year to breed in order to maximise quantity? Are there periods to avoid, such as moult etc.? Table 4 shows the results of a data study.

Table 4												
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hatchability	35%	36%	39%	37%	36%	42%	39%	38%	36%	37%	36%	31%

Table 4 shows no dramatically good or bad months to breed. This surprisingly shows that there is no special benefit to breeding in spring (i.e. Sep-Nov for the Australian climate in the above data). Past colony breeding showed increased preference for breeding in spring but if the birds chose (or are forced) to breed outside spring, then their actual hatchability is unchanged. In other words, the natural desire to breed is stronger in spring but the actual hatchability achieved doesn’t vary with time of year.

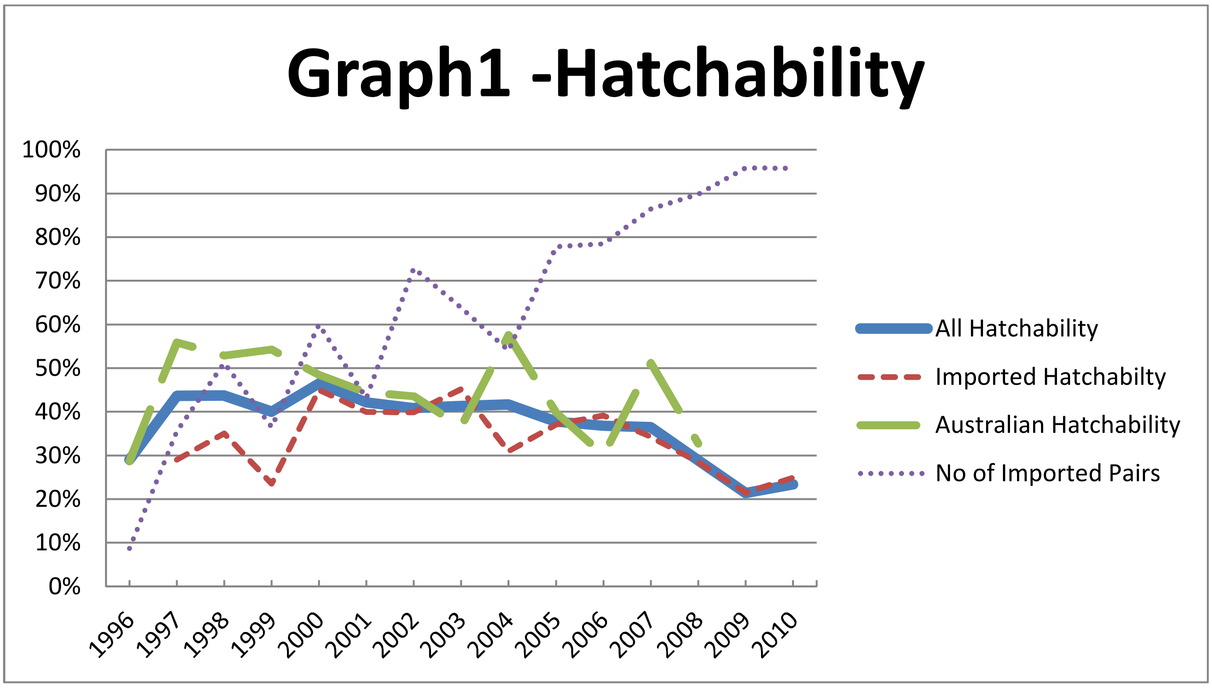
Likewise, the major moults in April and October have little effect on hatchability. There is however, a major proviso to the moult situation. Practical experience has shown that birds which are paired up immediately before or during their major moults tend to have poor fertility and hatchability but this is not reflected in the data above. This is because I avoid pairing up in these moult periods, but I instead pair up considerably before the moult and breed successfully through the moult period. Birds which are breeding successfully well before the moult commences actually substantially skip the moult and thus do not get most of the downside effects of the moult. When breeding finishes, they often immediately moult in order to catch up on the moult they missed.

The other proviso on the Table 4 data is that this applies to a mild Australian climate. Breeding outside of spring in harsher climates may bring reduced hatchability.

Large Feathers

The next issue to look at is the perceived issue of excess vent feathering preventing fertilisation during the act of mating. This has received a lot of press in the last two decades, in particular due to the reasonably rapid rise to prominence of large feathered birds in the exhibition arena. To alleviate this possible problem many breeders pluck or cut the feathers around the vent of each bird prior to pairing up. This however is not strictly a modern practice as I know breeders who have done this for over fifty years (long before the long feather fad). Many breeders do not admit to this practice however, as to some, it feels like a stigma, admitting that their strain of birds has a fertility problem. So, is there any truth to large feathers causing mating problems and is plucking or trimming a preventative.

In Australia the number of exhibition birds with large feathers increased dramatically with the importation of birds from England in the early 1990's and later indirectly from continental Europe. In my case the introduction of birds with imported ancestry was a gradual process and I kept many Australian exhibition strains going (particularly in the very rare varieties, as one had no alternative but persevere with the "older style" Australian bird). This gives me a reasonably unique ability to compare the breeding capability of large and short feathered birds at the same time. Graph 1 below shows the hatchability of imported birds and Australian birds and also the combined hatchability of all birds from 1996 to 2010. Superimposed on this is a line showing the gradual increase in the percentage of breeding pairs with imported ancestry in my whole aviary.



Graph1 shows a few features:-

i) 1996 was a one-off poor year. This can be easily explained as this was the year the birds were moved from one residence to another and was their first year in a completely new and quite different aviary. Stress of relocation and slight climate change is a major factor.

ii) The percentage of pairs with imported ancestry increases from 9% in 1996 to 95% in 2010. While not every bird with imported ancestry necessarily has large feathering, it does however reflect the general increase (with a probable time delay) in the percentage of birds with large feathering over time.

iii) In the 12 year period from 1997 to 2008 where there is sufficient data to make a meaningful comparison between imported and Australian birds, it is noticeable that the Australian birds had better hatchability than the imported birds in 10 out of 12 years.

iv) Overall hatchability across all birds peaked in 2000 and had a continual slight decline until 2007 followed by a dramatic decline from 2008 to 2010.

A conclusion that can perhaps be drawn from this is that imported birds generally had poorer hatchability than Australian birds and the more imported birds one had breeding over time, the worse the overall hatchability of the whole aviary became. What then is the reason for the poorer hatchability in imported birds? Is it genetic predisposition to poor hatchability or is it large feathering?

If large feathering is the cause then the practice of plucking vent feathers should help. In 2008 through 2010 I tried plucking the vent feathers from my pairs (a practice I previously did not do). Graph 1 above shows that this 2008 through 2010 period was dramatically bad for hatchability. As with lots of statistics, it should not be taken at face value. Feathers are plucked when the birds are first paired up. These same feathers start to grow back within two weeks and are usually fully grown back by about 5 weeks. This means that the plucking only has any potential benefit for the first breeding round only. Second and later rounds have the feathers grown back unless they are plucked again.

Table 5 looks at hatchability data for three years without plucking and three years with plucking but also looking on a round by round basis.

Table 5

Year		Round 1	Round 2	Round 3	Round 4
2005	Not Plucked	32%	36%	47%	44%
2006		37%	36%	32%	55%
2007		33%	40%	31%	55%
2008	Plucked 1st Round	33%	32%	18%	22%
2009		28%	18%	15%	19%
2010		28%	21%	17%	47%

In this data the round 4 hatchability is generally very good compared to earlier rounds, which would seem unexpected. This can be explained because almost all pairs in my breeding program have two rounds and it is very common to have three rounds, only those exceptional pairs who have already displayed good breeding behaviour in the first three rounds are permitted to have a fourth round. Thus round 4 hatchability data in table 5 is biased toward good hatchability and thus should not be compared against earlier rounds. Although it does display what levels of hatchability can be achieved by the best breeding pairs and thus sets a goal (about 55%) for all pairs to strive.

In the first three years where no plucking was performed there is no obvious trend from 1st to 3rd round. It is a mix of slightly up and down or near level. In the last three years where plucking was performed in the first round, the trend is always worse in 2nd and 3rd rounds This tends to suggest that plucking before the first round improved the hatchability of the first round, and hatchability deteriorated in the later rounds when not plucked. Therefore, plucking feathers does seem to work. Is there a case now to pluck the birds again before the second and third rounds? The advantage of cutting feathers with scissors instead of plucking would mean that you only need to do this once per season instead of each round as cut feathers do not immediately regrow. The disadvantage to cutting is that it usually leaves the sharp stumps of quills behind and this can have a “porcupine” effect which can make the act of mating awkward or painful and of course this leads to failure to mate and poor hatchability. Data on cut feathers is a research project for the future.

Again looking at Table 5, despite plucking the 1st round in the final three years, hatchability levels were still the worst of any previous years going back to 1996 (and probably would have been worse again had I not plucked feathers). So despite the large feathers being detrimental to hatchability there must also be another factor contributing to a decline in hatchability. Such things could be a bloodline genetic deficiency or even a decline in husbandry and housekeeping standards by the owner (It’s not always solely the bird’s fault). Genetic deficiency can be addressed by culling birds for poor breeding ability as well as poor quality.

Failure to Hatch

Assuming that an egg is fertilised then there are still reasons why it will not hatch such as, but not limited to:-

i) Damaged or broken eggs due to

    a) Nest box design
    b) Parent breakage
    c) Human breakage

ii) Addled or dead in shell due to
    a) Malformed eggs
    b) Environment
    c) Genetic weakness
    d) Poor incubation
    e) Poor housekeeping
    f) Poor nutrition
    g) Disease

Of these I will concentrate on the addled and dead in shell and some of the measures we can take to minimise these issues and hence improve hatchability.

Malformed eggs (including too big/small or porous) can be the fault of poor nutrition or poor health including old age and tumours etc. Hens which continually produce malformed eggs should be culled.

Environment causes include incorrect humidity, air temperature and presence of chemicals (e.g. poisons, pesticide strips etc). If the membrane inside the egg shell dries out then the fully formed chick inside often gets stuck to the shell and cannot rotate around inside the shell to chip out, resulting in dead in shell.

Genetic weakness includes predisposition for unhealthy embryos and lethal genes. Families displaying these traits should be culled.

Poor incubation is primarily the fault of the hen, including spending too much time outside of nest, or not consistently sitting on eggs until several have been laid. Although night fright, vermin, illness and bad food can also cause hens to stop sitting for periods.

Poor housekeeping relates to clean nest boxes. Nests do not have to be spotless but too many droppings (particularly from previous chicks and parents) can partially bury eggs. Eggs need to roll around a small amount in order for the embryos to develop in the correct position inside the egg. Conversely if they roll around too much (in the case of flat bottom nests or parents who play soccer with eggs) then the embryos get damaged. Wet nests also can contaminate eggs, as egg shells are porous and do absorb chemicals from the environment.

Poor nutrition relates primarily to the hen before the egg is laid. All the nutrients the embryo requires are deposited by the hen inside the egg. If the hen has a deficient diet then the embryo will also be deficient.

Eggs are porous and can in some instances get diseases from their environment.

Many of these failure to hatch examples above deserve full research in their own right and require somewhat more scientific knowledge than the layman possesses. Similarly I have not addressed the next stage, rearability, i.e. the raising and survival of a newly hatched chick to adulthood.

Summary

In order to breed quality birds you require parent birds capable of producing quality chicks. In order to breed lots of quality birds then it is advantageous to have parent birds capable of producing lots of chicks. One aspect of producing lots of chicks is to maximise the hatchability of parent birds. Table 6 below summarises things we can do to help achieve that goal of maximising hatchability.

Table 6	
Issue	**Remedy**
Age	Parents less than 6 years old. Slight preference for 1 – 2 years old.
Illness/Disease	Do not use ill birds, nor birds with inadequate recovery time from previous illness.
Moult	Do not pair up birds which are actually moulting. Pair up after the moult or considerably before the moult and breed through the moult period.
Out of condition	Do not pair up birds out of condition. Wait until they have an active libido. Check for latent illness.
Stress	Do not pair up birds which are undergoing stress (e.g. overshowing, disease recovery, changed location, changed diet etc)
Breeding Cage	Ensure enough space for the act of mating to take place comfortably. Ensure perches are solid, with good grip and appropriate size.
Excess Vent Feathering	Pluck large vent feathers before each round. (or perhaps cut feathers before 1st round)
Lack of Libido	Pair up only when active (Libido often increases in spring), or cull birds which continually have lack of libido.
Physical Disability	Cull birds with disabilities or modify cage design to better assist with act of mating.
Breeding Season Time	In harsh climates, breed in spring. In mild climates the time of year is irrelevant.
Damaged Eggs	No sharp objects or edges in nest box. Trim sharp nails and beaks of parents. Remove and transfer eggs from difficult parents as immediately laid. Minimise human handling of eggs.
Malformed Eggs	Ensure correct nutrition and exercise of hens. Cull repeat offending hens
Environment	Remove hazardous chemicals from aviary. Monitor and adjust humidity (with open water containers). Monitor and adjust room temperature.
Genetic Weakness	Cull families with consistent poor hatchability.
Poor Incubation	Transfer eggs to other hens. Cull repeat offenders. Ensure no distractions e.g. vermin, noises etc. Ensure no illness and good food,
Nestbox Housekeeping	Regularly clean nestbox of excess debris. Carefully clean eggs which are covered in droppings.
Parent Nutrition	Ensure good balanced diet before and during breeding.