A Screening Protocol to Select Breeding Birds, (Or …How to Get the Best Out of A Bird Collection

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Introduction

Avian medical literature, as well as avicultural books contain few references to the selection of breeding birds. References on management of avian flocks typically describe the strategies to keep diseases out of the breeding center or concentrate on the general management of the aviary, feeding and building materials. Often the attention is directed toward the right perches, nests, feeders and drinking bowls rather than to develop a system that helps to determine if a bird is potentially a good breeder, if it has problems which can be worked out, or if the bird must be removed from the breeding stock.

The selection of breeding birds is often based upon the preferences or the ideas of a collection's owner, or curator, when it is a big settings. In most cases, this selection is also based upon avicultural myths, or it depends on the physical appearance of birds. Rarely is there a scientific approach to the selection of birds intended for breeding, especially when infertility problems rise. In this case, birds are usually supplemented with vitamins, nutrition is improved, sometimes antibiotics are given and rarely hormonal therapies are tried. Most of the times non-producing pairs are split, to see if one of the mates can produce with another bird and, in the positive case, the not-producing animal is simply sold, with no diagnosis.

General Facts

Evaluation of birds intended for breeding should begin with a review of the history of the pair including:

- A a general overview of the collection: this will help to determine if the setup of the breeding station is following a logical plan, or low breeding performance may depend on a general poor flock management;
- B a complete history of the pair, as a "breeding unit";
- C a complete physical examination of the birds, as individual patients.

A. General overview of the collection: as pointed out in several avicultural papers, problems may be hidden in a general mismanagement of the bird collection. Several aspects of a bird breeding center should be carefully examined, but the most important points to check are:

- Is the collection composed by birds belonging to different species and genus, or is it focused on a single systematic group?
- Is the geographical and taxonomic distribution of birds following an order, or is it depending upon different criteria? (i.e. date of arrival, available space at given time, etc.)
- Outdoor aviaries: is every species of bird in an appropriate place? (in terms of temperature, humidity, sun/shade, neighborhood).
- Indoor aviaries: is every bird species in the right "artificial" environment? (cage, aviary, perches, feeders, bowls, nest).
- Are the different bird species/groups fed correctly? (kind and choice of food, freshness, storage).
- Is there a seasonal change in the daily routine? (food variety and amount, timetable, showers, heaters, behavioral enrichment).

B. Complete history of the pair: a special form has been developed (*Loro Parque Breeding Pair Production Check Form*), that helps the examiner running a rational evaluation of a breeding pair.

1. The first part of this form (tab. 1) analyzes the history of the birds as single animals and traces few notes about their history as a pair. We want to know the origin of each bird, its age and medical history. This can help to understand the origin of several breeding problems. For example:
- birds can be too different in age;
- they can be overall too young or too old to breed regularly;
- they can be "mentally disturbed", by an imperfect knowledge of their species behavioral patterns (as occurs in some imprinted animals);
- they can originate from a breeding station that is known for having specific problems, etc.

2. The second part of the form (tab. 2) is used in the evaluation of breeding performance. This part is a survey on egg production, fertility, hatchability and chick vitality. Theoretically it would be wise to go back as far as possible, but the last three years are generally enough.
It is very useful to discriminate between:
- permanent infertility (eggs which are consistently infertile),
- low fertility (normal number of eggs/year, but with a low percentage fertility),
- cyclic problems (infertility related to season, or to other factors).

Naturally we should also take into consideration the possible presence of infected eggs. While it may be impossible to tell if infected eggs were fertile or not, at least we know that we are probably facing an infectious disease of one of the parents (generally the hen), that can pass into the egg. Environmental contamination should be investigated.
Hatchability of eggs must also be addressed. This section of the evaluation helps to determine if the problem is totally, or mainly, related to natural or artificial incubation and if it occurs before, or during hatching.
Chick's vitality is also important. Understanding why chicks die (if they do), and locating this data chronologically is helpful to point out if a problem is mainly depending on management (i.e. chicks die only in the hand rearing station), or has a infectious cause (chicks from a specific pair are all infected with *E. coli*).

C - physical and endoscopic examination of the bird: the amount of information that must be collected and taken into consideration, when evaluating breeding birds, such as management procedures, nutrition, environment, aviary records, physical examination, and laboratory diagnostic testing, will often lead to an accurate rating of the bird as a possible breeder.
The third part of the form (tab. 3) is designed to record all the information collected during the bird physical examination. Authors prefer to run this examination with the patient in general anesthaesia, and this for two reasons:

- breeding birds may be accustomed to humans, but are normally not tame, so a physical restraint that turns into a wrestling match is very stressful, likely will lead to altered blood values and can even be dangerous to the bird. On the other hand, if the bird is anesthetized, it will be very useful to point out subtle defects, such as impaired mobility of limbs, as well as to discover major problems.

- the physical examination is immediately followed by a complete endoscopic evaluation, that can detect problems related to the sexual apparatus as well as other health or anatomical problems that could affect the sexual activity of the bird.

After these manoeuvres have been run, the veterinarian is ready to determine a gross rating of the bird as a possible breeder. In the authors' experience, the gross rating is not necessarily confirmed by the results of the laboratory testing, but it is important to gross-rate a bird immediately after the physical examination and endoscopic evaluation, to "fix" the feeling the patient is giving to the examiner. The rating can always be changed at the light of laboratory testing.

The last (fourth) part of the *Breeding Pair Production Check Form* summarizes the results of the laboratory tests. This is an important data-base for the healthy patient, but it will be even more important for the non-breeding birds. In facts, the fourth part concentrates on developing an action plan for low performing breeders. If a problem is diagnosed and can be fixed, indications on the treatment will be reported. If a problem with a poor prognosis is discovered, the bird will be removed from the breeding stock. If finally a diagnosis cannot be reached, additional testing will be recommended.

Difficult Birds: a different matter is when all the collected data cannot point out a reason for a bird, or a pair, to be infertile, or but when this examination does not lead to a diagnosis, deeper analysis are indicated.

One option is the evaluation of the semen. Semen can be voluntarily emitted from a trained donor, or it can be manually obtained by massage. Finally electro-ejaculation has been proven to be effective in selected avian species. Artificial insemination (A.I.) is a well described and routinely used technique in some bird orders (*Falconiformes, Gruiformes, Galliformes*). Many papers have been published about A.I. and several descriptions of avian sperm evaluation are available.

If we are considering parrots, one of the problems we have to face is that, whether sperm collection is rather easy in some small psittacines (Budgerigar, Lovebirds), in other species the technique is unpredictable (Conures), and in some Psittacine species is always difficult (Macaws, Amazons).
Whatever the method, and assumed some sperm has been collected, the obtained avian semen can be evaluated. To date, the only information we can achieve by sperm analysis is the quality of the sperm itself and eventually a diagnosis of decreased fertility (in the sense of a low number of viable spermatozoa).

Even with semen analysis still we have problems in detecting the causes of low breeding performance.

One of the most important new techniques that we developed at the Loro Parque, is the diagnosis of testicular problems in birds, through testicular (and sometimes ovary) biopsy. Testicular biopsy was introduced in the Loro Parque after the 2000 breeding season, and soon revealed itself to be one of the most useful tools in the detection of testicular diseases of birds.

Conclusions

The selection of breeding birds is a very delicate matter, and discovering the causes for bad breeding performance may be challenging.

A rational approach to the general management and birds history, can often point out the reasons for poor performance.

If this is not enough, a complete physical and endoscopic examination of the birds will help reaching a diagnosis for non breeding and help rating the birds as possible breeders.

Would this not lead to the discovery of the causes of bad breeding results, several new techniques are available for the selection of breeding birds.

One new tool to select breeding birds can be sperm collection and analysis, but if this test shows a decreased fertility, no other indications are given on the causes for low sperm quality.

We recently developed a technique to perform endoscopic testicular biopsies and found it an extremely useful tool in cases in which other diagnostic tests failed to reach a diagnosis for infertility. A diagnosis of testicular disease can so be made appropriate treatment of the bird can be implemented according to histopathology and laboratory results.

Table 1: first part of the *Loro Parque Breeding Pair Production Check Form.* In this portion the individual history of the breeding birds and their history as a pair are evaluated.

LORO PARQUE
BREEDING PAIR PRODUCTION CHECK

Species: ……; Cage nº: ……

1st PART: BREEDERS' HISTORY

MALE – code nº: …… origin: ……..……; arrival date: ...……; birth date: ……
Leg band or Microchip nº: .....
Sex determination: endoscopy (DVM …….) - DNA (Lab……); Breeding
Previous Partners: yes - no - if yes, why changed?: ……
Previous veterinary checks ? yes - no (DVM. ……)
Previous Sanitary Problems: ……..……

FEMALE – code nº: …… origin: ……; arrival date: ...……; birth date: ……
Leg band or Microchip nº:
.....
Sex determination: endoscopy (DVM …….) - DNA (Lab……); Breeding
Previous Partners: yes - no - if yes, why changed?: ……
Previous veterinary checks ? yes - no (DVM. ……)
Previous Sanitary Problems: ……..……

PAIR: year of pairing:……; n° of prev. pair cage moves: ……; same cage from n° …… years;
neighboring animals: right: ……..……..…… left: ……..……..……
front: ……...…… back: ……..…….……
Breeding Behavior: ……
Yearly Routine Treatments: deworming: no - yes : (period, drug & dosing) ……
pre-breeding: no - yes : (period, drug & dosing) ……..…….
others: no - yes : (period, drug & dosing) ……..……...…….

Comments to 1st part: ……....

Table 2: second part of the Form. Analysis of egg production and chick's vitality.

2nd PART: PRODUCTION ANALYSIS
(or, what we want to know of each year, for the three last years)

Survey on egg laying, fertility, hatchability and chicks vitality.
Year: ……..…

Nº of clutches: …… laying season (from – to): ……
Egg nº/clutch: 1˚…… 2˚…… 3˚…… - Total nº of eggs in the year: ……..…
fertile ..…… (……..…%); non-fertile …...… (…….%); - infected …...… (…….%);

Naturally Incubated Fertile Eggs:
hatched …...… (…..…%); not-hatched …...… (……..%); pre-weaning deaths. …...… (…..…%);

Artificially Incubated Fertile Eggs:
hatched …...… (…..…%); not-hatched …...… (……..%); pre-weaning deaths. …...… (…..…%);

Cause(s) of embryonic death: (EED - MED - LED) ……

Hatched Eggs/Tot. nº of laid eggs …… / …… (……%);
Hatched Eggs/Tot. nº of fertile eggs …… / …… (……%);

Hand reared/Tot. hatched: ……/…… (……%);
Living chicks at weaning nº …… (……%); Dead chicks pre-weaning nº …… (…… %);

Parent reared/Tot. hatched: ……/…… (……%);alive nº …… (……%); dead nº …… (…… %);
Living chicks at weaning nº …… (……%); Dead chicks pre-weaning nº …… (…… %);

Cause(s) of chicks deaths: …….

Comment to 2nd part (breeding performance)

PARAMETER	EVALUATION
N˚ clutchs / year	Low - Average - Good
N° eggs / year	Low - Average - Good
% fertile eggs	Low - Average - Good
% hatched eggs	Low - Average - Good
Chicks vitality	Low - Average - Good
Hand reared chicks performance	Low - Average - Good
Parent reared chicks performance	Low - Average - Good

……
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Table 3" Third part of the Form. Physical examination and endoscopic check of bitds.

3rd PART: CLINICAL EXAMINATION OF BREEDING BIRDS
(this data must be collected from both birds)

Male Bird - clinical examination:
Weight : _____

norm. abnorm.
Gen. Body Cond.
Skin:
Feathers:
Beak:
Nostrils:
Eyes:
Feet:
Pharynx/choana:
Cloaca/Vent:
Locomotory Syst.:
Respiratory Syst.:
Circolatory Syst.:
Nervous System:
Urines/Urates:
Feces/ Stools:
Any Other: _____

General Comment on Clinical Examination:

Further Diagnostic Suggestions:

Endoscopic Check
Bird identification:
open band (right - left); closed band (right -

Gender confirmation: male - female

Reproductive Tract:
juvenile;
adult (active - inactive);
pathologic; comment: ……

Eventual other abnormalities not related to the reproductive apparatus: no - yes :
……

Bird gross endoscopic rating:
breeder quality;
average adult;
healthy, juvenile bird;
sexual apparatus abnormalities;
other abnormalities, that might lead to breeding failure.
……
……

Table 4: fourth part of the Form. Laboratory test results and suggestions about birds and pair.

4TH PART: SUMMARY OF TEST RESULTS & OVERALL INDICATIONS
(this data must be collected from both birds)

Male Bird – laboratory workup:

Psittacosis (date ----/----/----)
Clearview positive negative
Immunocomb positive negative
PCR positive negative (Lab: ……)

PBFDV (date ----/----/---- Lab: ……)
positive negative

Polyomavirus (date ---/---/---) (lab: ……)
PCR positive negative
serology positive negative

Mycology (site and result): ……

Bacteriology (site, result and antibiotic sensitivity): ……

Hematology: ……...……...

Blood chemistry: ……...

Testis biopsy: ……..……...

Other biopsies (……..): ……

General Comments on Pair: ……...……
……...…….

Suggestions for breeding purposes: ……...……
……...…….