

incubation workshop organized and led by Kasielke in August 2007, hosted by the Zoological Society of San Diego (ZSSD). Developed and taught by Kasielke with assistance by experts from San Diego Zoo and ZSSD's Conservation and Research for Endangered Species (CRES) Center, the three-day workshop focused on techniques in human-conducted, or artificial, bird egg incubation.

'The idea of the workshop was to give people tools not only to do artificial incubation of eggs, which is important to captive bird programs, but also to better manage eggs when they're incubated by the parents,' says Kasielke. Although many of the methods discussed could be applied to all bird species, the tutorial was primarily concerned with birds of prey.

Kasielke has directed similar workshops on egg incubation for more than 15 years. This particular workshop was spearheaded by the Eagle Conservation Alliance (ECA), an international coalition formed in 2006 and dedicated to protecting the world's 74 species of eagles. One of ECA's first priorities was initiating a teaching seminar on egg incubation. To that end, ZSSD helped arrange for two biologists – Anna Mae Sumaya and Edison Dayos – from the Philippine Eagle Foundation (PEF) to participate.

Ensuring that enough eggs are successfully hatched is an essential part of preserving bird species, but artificial incubation is a challenging process that can be affected by everything from the parents' genes to the health of the individual egg. 'One of the first misconceptions that we try to dispel is that if you get a good incubator and have the right recipe for incubating the eggs, then they always come out hatched,' Kasielke says. 'It's never that simple. It's always a situation in which you have to know the idiosyncrasies of each machine, the species characteristics of the eggs, and make adjustments as incubation progresses.' Thus, the workshop was especially con-

cerned with using various kinds of incubating equipment, and with manipulating the three main parameters of artificial incubation – temperature, humidity, and proper turning.

The ability to successfully hatch an egg in an artificial incubator opens up numerous opportunities to support bird populations. For example, birds are often capable of laying more than one clutch of eggs in a given breeding season. The trick, Kasielke explains, is to take away the first clutch soon after it's laid, which will prompt the parents to lay more eggs. Two groups of chicks are then hatched instead of one – the first by artificial incubation and the second by the parent birds. Thanks to this method Los Angeles Zoo was able to help produce a tenfold increase in the California condor population since 1987.

Another useful technique involves exchanging a real clutch with 'dummy' eggs, which are designed to fool birds into continuing to look after them. This allows caregivers to protect the real eggs from natural threats and to ensure healthy incubation, while still leaving open the possibility of returning them to the nest before the chicks hatch. This method is often used with inexperienced parents, not only because they have a greater chance of losing their eggs, but also because their genes may be less well represented in the population. If the parents seem to be competent enough with the fake eggs, then the real ones are given back. Like all techniques, the procedure differs greatly based on the species of bird in question. 'Some birds are very particular [about dummy eggs],' says Kasielke. 'If the egg isn't the right weight, the right temperature, the right balance, then they'll reject it. Other birds will set on just about anything: rocks, a piece of wood, or whatever is at hand.'

Of course, none of these methods would be possible if zoologists and conservationists were not confident in their abilities to artificially nurture eggs. Understanding incubation is thus an indispen-

sable part of bird conservation, regardless of location or species, and this is one reason why Kasielke finds the egg workshops so worthwhile. 'People really remember the workshops,' she says. 'I will get calls several years later from people saying, "Oh, I have this problem, and I remember you taught us this and showed us that." It really does seem to be something that's valuable to them, and that's very rewarding for me.'

Daniel Kuo in *Zooscape* Vol. 31, No. 5 (November 2007)

Paignton Zoo Environmental Park, U.K.

The zoo's new £1.5m Crocodile Swamp exhibit is home to Cuban, Nile and saltwater crocodiles. The three female Cuban crocodiles are all around two metres in length. Cubans are endangered, and these are the only ones in Britain. Two of them have been at the zoo for some time: one was hatched in 1991 in Stockholm and came to Paignton Zoo in 1993, and the other was confiscated in 1993 from a Russian sailor on a ship in Liverpool docks. He had bought the animal in Cuba, where it is likely to have been caught in the wild. A third female has come from Wrocław Zoo in Poland – a road journey of some 1,200 miles [1,900 km]. The animal is adult and was hatched in Latvia.

In addition, a pair of Nile crocodiles (both around 20 years old and 2.5 to 3 metres in length) has also come from Wrocław Zoo. The male was bred in a collection in Silesia in the Czech Republic and the female was hatched in Poland. The female saltwater crocodile has come to Paignton from Thrigby Hall in Norfolk, U.K. Bred on a crocodile farm near Kuching in East Malaysia, she is one of four who arrived at Thrigby Hall in 2004, and is thought to be seven or eight years old. The saltwater crocodile is the world's largest living reptile: the zoo's animal is currently around 2.6 metres in length, but males can grow to over six metres.

She is one of only four saltwater crocodiles in the country.

'We are very proud of Crocodile Swamp,' says Colin Bath, Curator of Birds and Reptiles. 'It is the first new dedicated crocodile exhibit since the house at Thrigby Hall was built in 1992. It is a splendid home for some splendid animals.'

Abridged from a Paignton Zoo press release

Patna Zoo, India

The successful breeding of eight Indian rhinos puts Patna Zoo up among the world's top breeders of this species, second only to San Diego Wild Animal Park. This high breeding rate has brought the zoo into international focus, says Director Rakesh Kumar, and zoos in many countries now want to know Patna's technique, the kind of food they give to their rhinos, the size of their enclosures, the temperature best suited to them for mating, and other such information.

India's Central Zoo Authority (CZA) has selected Patna Zoo as the ideal breeding centre for rhinos under its ambitious project for the conservation of endangered species. The CZA had earlier selected Bhopal Zoo (Madhya Pradesh) as a breeding centre for tigers, Junagarh Zoo (Gujarat) for Asian lions and Darjeeling Zoo (West Bengal) for snow leopards. Kumar says that ISIS has offered membership to the zoo for sharing information on the techniques involved in breeding the species.

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Rainbow Springs Nature Park and Kiwi Encounter, Rotorua, New Zealand

After a slow start to the current breeding season, compared to last year, the eggs and chicks have been quite numerous,