

## Nests of *Anhinga novaehollandiae* as nuclei for the breeding of Phalacrocoracidae

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Mees, G.F. Nests of *Anhinga novaehollandiae* as nuclei for the breeding of Phalacrocoracidae. Zool. Verh. Leiden 323, 31. xii. 1998: 417-425, figs 1-2.— ISSN 0024-1652/ISBN 90-73239-68-0. G.F. Mees, 31 West Street, Busselton 6280, Western Australia.

Key words: Phalacrocoracidae; *Anhinga novaehollandiae*; Western Australia.

In the years 1992/1998, in Busselton, W Australia, nesting of two species of cormorant, *Phalacrocorax melanoleucos* and *P. sulcirostris*, always took place in close proximity to inhabited nests of *Anhinga novaehollandiae*. Evidently, nests of the latter strongly attracted cormorants about to start nesting. Although this attraction had been noted before (Vestjens, 1975), strangely, it was ignored in later standard works.

### Introduction

The nesting of large water-birds, notably species of Phalacrocoracidae, Ardeidae and Plataleidae, in mixed colonies is well-known, and indeed, being obvious, has been so for many centuries. The question of how such mixed colonies originate, whether there is a particular sequence in the establishment of the different species, or, in simple language: what attracts what, has rarely been posed and is difficult to answer as it requires observations right from the beginning of establishment. Yet, to me, this elusive question seems of great interest. As a small contribution, I present here my observations on the relations and interactions between nesting *Anhinga novaehollandiae* (Gould, 1847) and two species of cormorant, *Phalacrocorax melanoleucos* (Vieillot, 1817) and *Phalacrocorax sulcirostris* (Brandt, 1837), made in Busselton, Western Australia. That only three species are involved, and in small numbers, is an advantage, because the situation is simple and therefore clear.

The central species to be discussed here is *A. novaehollandiae*. This is a common bird in and near Busselton. It can be found nesting along the Vasse River (which flows through Busselton) throughout the year, although never in large numbers. The largest number of nests inhabited simultaneously that I have hitherto noticed is only eight. An interesting point is that here the species is not strongly colonial. When a nest is built, a second may appear less than 2 m away, but equally likely 20, 50, or 500 m from it. However, even at half-a-kilometre the advertising males are still within calling-distance from each other. Because of the requirements: solid branches overhanging not-too-shallow water, the number and extent of suitable nesting-places is limited; most popular is a row of poplars (*Populus alba*) of about 100 m in length, opposite the council-chambers. Some weeping willows (*Salix* cf. *babylonica*) are used regularly and, as the only native tree, *Melaleuca cuticularis*.

Incidentally: in the literature, one often finds enumerations of tree-species in which nests of certain species of birds have been found, sometimes even concluding with something like: "43 % in oak, 12 % in beech...". In the case of *A. novaehollandiae* it cannot be a matter of botanical knowledge or preference, the choice must be based on branches over water of sufficient depth and, secondly, these branches must struc-

turally be able to hold and support a nest with large and heavy birds in it. Any tree fulfilling these conditions, whether native or exotic, would be acceptable.

### Observations

The following protocols of observations support the thesis that, in Busselton, *A. novaehollandiae* occupies a central position in small mixed colonies. Abbreviations used below: AN = *A. novaehollandiae*, PM = *P. melanoleucos*, PS = *P. sulcirostris*.

#### *Phalacrocorax melanoleucos* (Vieillot, 1817) (1992/1993)

First visit on 6 December 1992, when there was, in the poplars, one nest of AN, and very close by, two of PM, all three nests with sitting birds. The next day, I noted that the AN nest contained two naked, but already rather sturdy young and that at least one of the PM nests also had small young. The young of both species, including those in the third nest, continued to grow well, and remained on or near the nests until mid-January 1993.

13 March.— Two AN nests with young. A PM carrying branches in the same tree, but nest-building was abortive, not continued on following days.



Fig. 1. Nest with three large young of *Phalacrocorax melanoleucos*. Straight above them a second nest of the same species. To the left, a nest of *Anhinga novaehollandiae*, of which the large young have wandered off, and are just visible below the left-hand upper corner of the photograph (31 December 1992).

17 July.— Two AN nests with sitting birds; just in front of the left-hand nest, a PM standing on a grass-foundation; about two metres away, in another fork of the same tree, a second foundation with a PM in attendance. Around the right AN nest, at least three PM nests building; I noted, in particular, how close these were to the AN nest.

23 July.— The right AN nest surrounded by at least three PM nests, with sitting and standing birds. The left AN nest, and its satellite nests, were apparently abandoned.

27 July.— All nests abandoned. The council groundsman told me that the nests had been robbed by human nest-robbers. So that was the end of the observations for a while.

6 October.— One AN nest, the old right-hand nest mentioned above, again occupied, with a female sitting, a male standing; below this nest, two occupied nests of PM: one with a bird standing, arranging twigs with its bill, the other with a sitting and a standing bird.

21 October — All well; I counted now at least 7 PM around the AN nest and got an impression of more than two PM nests, but all was so close together below the AN nest, that I could not make this out for sure.

8 November.— A visit showed the AN now with small chicks, and three PM nests in good condition; these nests were very close, one of them practically attached to the AN nest, These nests continued to fare well.

On 25 December the AN young had left, but the PM nests still contained young (the nest built against the AN nest had three large black young). In this case the PM had not managed to complete their breeding-cycle before the AN completed theirs.

(1994/1995)

Although in 1994 breeding of AN took place normally, no nesting of cormorants was observed. In 1995 I was abroad for most of the year.

(1996)

1 November.— In a *Melaleuca* tree along New River (a branch of the Vasse, no more than a few hundred metres away from the poplars), a small group of PM nests, in various stages: one adult bird displaying on a branch, one bird sitting on a nest and presumably incubating, one nest with two very lively half-grown young, a large black young begging on a branch, two even more advanced juveniles, with white breast and belly and black sides to the head, jumping and climbing through the branches. This colony had to have had a nucleus, and there, on a low branch in the middle of it, I discovered a young AN: bag-shaped, mostly beige, but with developing black remicges.

6 and 7 November.— Situation the same. It should be mentioned that, at this spot, the New River is over twice the width of the Vasse opposite the poplars, which means that the observations were also made from at least twice the distance. Add to this that *Melaleuca cuticularis* is a rather dense-growing tree, with contorted branching, and it will explain why these observations are less satisfactory than those made in the poplars on the Vasse.

*Phalacrocorax sulcirostris* (Brandt, 1837)  
(1996)

10 May.— Two AN nests in the poplars, one with an incubating male, the other with two well-developed young standing on a branch just beside it. About 12 PS were perched on branches nearby, three so close that actually they stood in the way when the parents came to feed the young AN: they were prepared, reluctantly, to move a few steps away, but refused to fly away. No sign of nesting by PS.

26 May.— The large left-hand AN nest was very busy, with three almost fully grown young. The right-hand nest appeared now to have young also, just hatched. Close behind the left nest a third nest was noted, with a male incubating. At first I was disappointed to see no more than a dozen-and-a-half PS, but with some flying to and fro, this number increased to about two dozen, some 10 of which were concentrated about the left AN nest-mass and this time I observed courtship movements by some birds in the group.

27 May.— About 90 PS in the poplars, many of which were close to the AN nests.

28 May.— Some 40 PS, with a clear concentration about the left AN nest-mass, several making courtship-movements. Several PS stood in pairs, and one was holding a twig for an extended period, but no visible nest-building yet.

1 June.— I counted 66 PS in the poplars, with concentrations near the AN nests. Now busy nest-building: three nests in the left group, and three near the right-hand AN nest; courtship-movements.

2 June.— Colony in full development, busy building. I was surprised to see that most of the twigs used were fished from the river-bottom by diving.

7 June.— PS consolidating; continued nest-building, but I saw no advertising; sitting birds made me suspect eggs: if so, that must have gone very fast.

10 June.— 10 PS nests counted, the majority in the left-hand group.

17 June.— Colony in good shape. As usual, there were, besides the nesters, scores of non-breeding PS, and a single PM. I witnessed a sudden panic: all resting birds flew straight into the water. The PM also came, and swam about calling loudly, with wide-open bill; the PS kept silent, and kept their bills closed. I identified the cause of the panic to be a rarer, *Circus approximans* Peale, 1848. After it had passed, the cormorants flew gradually back into the trees.

23 June.— A little to the right of the left-hand group, a new AN nest with a female sitting.

29 June.— 14 PS nests.

2 to 29 July.— Everything going well. It struck me that even on nests with young, building continued.

4 August.— AN nests still occupied.

7 August.— The lower-right AN nest again occupied; PS mostly advanced, with large young climbing about.

29 August.— PS nesting approaching its successful conclusion, the young sitting on branches near the nests. A nest with less advanced young next to the right-hand AN nest (with an incubating bird).

9 September.— 25-30 PS in the colony, mostly ambulant young. The right-hand AN nest now with small chicks, perhaps a week old.



Fig. 2. *Phalacrocorax sulcirostris* settling around *Anhinga novaehollandiae*. The bird in the middle, on an unfinished nest, is displaying. Two nests of *Anhinga* are visible, both with incubating birds: one in the lower left-hand corner, the other behind the head of the uppermost cormorant (2 June 1996).

18 September.— On the right-hand AN nest a male sitting high, evidently sheltering young. A little above, a PS nest with rather large young. In the left nest-mass three or four PS nests with large young left. Only a few old birds present.

27 September.— Young in right-below AN nest well-developed; some seven PS nests occupied with sitting birds, apparently a new round of breeding in the same nests: second broods, or, more likely, different birds?

8 October.— AN nest with three large young. The PS are sitting deep in their nests, incubating; no young of the first generation left.

29 October.— AN nest now deserted, young presumably fledged; several still active nests of PS.

5 November.— Nesting of PS nearing its end: four inhabited nests, of which three with large young, one with slightly smaller ones.

7 December.— I had been away for three weeks. Still some activity: a good half-dozen birds, characterized by their brownish-black plumage as juveniles, hanging about; no occupied nests.

12 December.— I counted five young fledged birds on branches near the nests, none on a nest; they did not show any activity and therefore I am not sure whether they were independent or still being fed. Anyway, it was clear that nesting of PS was over.

Recapitulation: The first indication that nesting might take place was on 24 May; 26 May displaying; 1 June nest-building; 6 June eggs were suspected; hence, nesting extended over a period of ca six months, June-November, in two waves.

(1997)

Early February.— I found an AN nest with three large young in a *Melaleuca* tree along the Vasse River, so that nesting must have begun in December 1996. However, in the poplars, nesting of AN started mid-March. Numbers of PM and PS came resting and roosting in the poplars, but as yet without indication that they would nest.

2 April.— AN incubating on one nest; a second nest was unoccupied during my visit, but contained green leaves. Over 30 PM and almost 30 PS were resting nearby, but showed no signs of breeding-activity.

8 May.— AN: the top nest with two well-grown chicks, the bottom nest as far as visible not occupied. My wife checked the situation towards evening and established the presence of three AN nests. She thought she saw displaying cormorants near the AN nests, but could not be sure because, towards evening twilight, almost 200 cormorants of both species (PM and PS) had arrived to spend the night.

9 May.— Another visit showed me that the third nest was in the old left-hand group. Yesterday and today, I saw one PS sitting on a nest.

14 May.— Three AN nests, The situation with PS was not clear: the nest on which I had seen a bird during previous visits was not occupied, and was possibly abandoned (perhaps too far, about 10 m, from the nearest AN nest?), but around the left-hand nests, some 20 PS were perched, several of which were waving their wings.

19 May.— About six PS nests occupied with standing and sitting birds, near the left-hand AN nests.

15 June.— Now five nests of AN along the Vasse. Around the left-hand group a concentration of at least a dozen PS nests, and one more a little to the right.

3-19 July.— Everything in order with the colony.

7 August.— Everything in order with the PS colony; about a dozen fully-grown juveniles present, proof of advanced successful breeding. Whether a few sitting birds were young or old (old birds would indicate continued nesting), I was unable to see with certainty.

12 August.— Large young of PS. No inhabited AN nests left in their group, but a little to the right two AN nests with small chicks.

10 September.— Near the left-hand group of nests, I counted some eight PS, but I got the impression that their presence was fortuitous, and that nesting was over.

15 September.— More life around the nests than during my previous visit: several birds standing on or near the nests, and two of these were displaying, suggesting the beginning of a new round of nesting.

27 September.— Predictably, several PS standing on and near the nests, and a few birds sitting. This was interesting, as no inhabited AN nest was left in this group.

11 October.— Disappointingly, after the positive signs during my last visit, the PS had given up, not a single bird was to be seen near the nests. Perhaps this has something to do with the absence of nesting AN in this group? (about 50 m to the right, there was an AN nest, with an incubating female).

Recapitulation: Nesting of PS began about mid-May, concentrated near inhabited AN nests, and was successfully concluded by the middle of August. In September there was some display and occupation of nests, but unlike in 1996, there was no second round of nesting.

(1998)

Early April.— nesting of AN in the poplars began. Toward the end of April there were three occupied nests, with incubating birds.

4 May.— No suggestion of nidification of PS yet.

6 June.— I had been away for a few weeks, but seemed not to have missed much. In the left-hand group a male AN sitting on a nest. Around it eight finished and unfinished nests of PS, on each of which one or two birds stood. Several times I heard calling, and saw the wing-flagging display: this was the beginning of nesting and I do not think that here were eggs as yet.

1 June.— The hard wind and rain of the preceding days (it is mid-winter), has not visibly harmed the nesting birds.

23 to 28 June.— The PS colony in the poplars had now 14 nests in three groups, each with its nucleus of one or two AN nests. One of the groups, consisting of two PS nests and two AN nests, not in a poplar, but in a small *Melaleuca* tree standing between the poplars. All PS still incubating, no young. Two of the AN nests, on the other hand, had fairly large young. There is a difference between the colonial cormorants and the more individualistic AN: in the former, nesting is synchronized, so that most broods are in the same stage, but in AN it is quite usual to see a nest with large young, ready to fly, next to one in which incubation has only just started. In AN therefore, there is little or no mutual influence.

### Discussion

From the protocols presented above, it is evident that in every case where nesting could be observed from the beginning, it was the cormorants who joined the *A. novaehollandiae*, and in the few instances where breeding was too far advanced for certainty, the same could be deduced from the position of the nests and the ages of the young.

The way the cormorants settled around nesting *A. novaehollandiae* being almost universal and highly conspicuous, it seemed unlikely that it would never have been seen and remarked upon by previous observers. An obvious work to consult in this connection was that by Vestjens (1975), in which I found indeed a whole paragraph dealing with the subject; I quote:

“Trees used by Darters for breeding were also used by other species without antagonistic behaviour from either side. I found Yellow-billed Spoonbills *Platalea flavipes* nesting within 0.3 metres of Darters. A Whistling Eagle *Haliastur sphenurus* nested 1.2 metres above a Darter; both raised their young successfully. I saw several Darters' nests surrounded by nests of Black Cormorants *Phalacrocorax carbo*, Little Black Cormorants *P. sulcirostris*, Pied Cormorants *P. varius* and Little Pied Cormorants *P. melanoleucos*. These species moved into the nesting trees after the Darters

had established their nests. Many of the cormorants' nests were well within reach of sitting Darters but I never saw aggressive behaviour."

Both the European handbook (Cramp & Simmons, 1977: 223-226) and the Australian handbook (Marchant & Higgins, 1990: 798-807) based their accounts of *Anhinga* largely on Vestjens' work, yet, in neither is clear mention made of the matter discussed here, although both mention nesting of *Anhinga* "associated", or "mixed" with other species.\* The only possible explanation for this curious omission that I can think of, is that the subject does not readily fit into any of the rigid categories, followed by these handbooks, and therefore has dropped through the crack so to say.

As my observations indicate that *A. novaehollandiae* is at most a moderately social breeder, I was surprised by the tolerance it showed toward the two cormorant species (as also noted by Vestjens). Only once did I see a large young *A. novaehollandiae* lunge and peck half-heartedly at a *P. melanoleucos* scuttling over its nest, towards its own nest, to feed its young, forcing the *P. melanoleucos* to make a slight detour. Usually *P. melanoleucos* and *P. sulcirostris* would perch freely near the *A. novaehollandiae* nests, and even on the nest-rim, without being molested in any way. Even when they were clearly standing in the way (for *P. sulcirostris*, see protocol 10 May 1996), there was no aggression.

I have never seen any aggression between *P. melanoleucos* and *P. sulcirostris* either, and these species will freely mix when resting and roosting. Therefore, I cannot explain why, in the poplars, it was first *P. melanoleucos* that nested with *A. novaehollandiae*, and in later years *P. sulcirostris*, but never the two cormorants together and mixing.

The attraction of nesting *A. novaehollandiae* to cormorants of the species *P. melanoleucos* and *P. sulcirostris* (as well as to other birds, according to Vestjens), is evidently a strong one. The question why this is so, would seem to be easily answered: *A. novaehollandiae*, with its large size, and very sharp bill, must be a powerful ally against predators, hence, a matter of protection. The only argument against this simple explanation, that I can think of, is that *A. novaehollandiae* is apparently a very tolerant species, not at all aggressive. It would be interesting to know how it behaves when confronted with reptilian, avian, or mammalian predators. Very likely, seeing other birds engaged in nesting activity would, by itself, stimulate colonial breeders like cormorants to join in, but that alone cannot be the whole explanation. The presence of old nests or platforms, surviving from a previous breeding-season, may have a certain influence, as they are readily occupied again. If nesting close together provides safety, one would expect that to act also intraspecifically for *A. novaehollandiae*: a dense cluster of nests would provide maximum security, but this species nests at most in very loose groups. In conclusion, there remains an open field for further observations.

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\*) I have previously voiced my objection to the fact that in the European handbook, so much information is taken from observations on the Australian *A. novaehollandiae*, to fill up deficiencies in knowledge of *A. rufa*. Although the two are often treated as conspecific, it is doubtful that they are, and observations on one should not be automatically transferred to the other (cf. Mees, 1979).



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