

# IDENTIFICATION CHALLENGE: TRUMPETER VS. TUNDRA SWAN

PIERRE DEVICHE, PHOENIX, AZ 85048, [DEVICHE@ASU.EDU](mailto:DEVICHE@ASU.EDU)

DOUG JENNESS, TUCSON, AZ 85739, [DOUGJENNESS@GMAIL.COM](mailto:DOUGJENNESS@GMAIL.COM)

Three swan species breed in North America: Tundra Swan (*Cygnus columbianus*), Trumpeter Swan (*C. buccinator*), and nonnative Mute Swan (*C. olor*). Mute Swan breeds very locally in the wild in the western United States, and because its identification is straightforward, it will not be further considered here. The Tundra Swan in Arizona is a casual to rare fall and winter visitor, with most reports in December, January, and early February (Monson and Phillips 1981, TAS 2015, Witzeman and Corman 2017, eBird 2021). It has been reported in all counties except Greenlee. The Tundra Swan is rarely seen in flocks, although 42 were reported at Cibola National Wildlife Refuge in La Paz County on 26 November 2010 (AZFO Data 2010).

The Trumpeter Swan is an accidental visitor to Arizona (Table 1). It is represented in the state by 14 accepted records (1994-2021), 1 pending review by the ABC, and 2 that haven't been submitted yet to the ABC. All reports are from December to February except for 2 that continued to early March. Most reports are of single birds, although 2 groups of 6 and 2 of 5 were observed. The species has been reported from 7 of the state's 15 counties. The ABC continues to regard occurrence in Arizona a result of birds dispersing from "wild" populations (Rosenberg and Radamaker 2021), unless records can be linked to a relocation program. Based on the data available to date, the winter occurrence of Trumpeter Swans in Arizona is slowly increasing (Table 1), likely due to successful reintroduction programs in other states (Trumpeter Swan Society 2021). Of the 17 Arizona reports, 10 were in the years 1994-2018 and 7 between 2019 and 2021. In the future Arizona birders may encounter Trumpeter Swans more frequently, and it will become increasingly important to be familiar with the features used to identify them.

Table 1. Trumpeter Swan Accepted and Pending Records in Arizona

Date	Location	County	No.	Age	Status
19-Dec-1994	Willow Tank	Cochise	1	imm.	A
1-Jan-1998	Gleeson	Cochise	1	Adult	A
30 Dec 2002-28 Jan 2003	Camp Verde	Yavapai	4	3 adult/1 imm	A
6-26 Jan 2006	Kino Springs/Corona de Tucson	Santa Cruz/Pima	6	2 adults/4 imm	A
12 Jan-26 Feb 2012	Willow Estates	Mohave	5	4 adults/1 imm	A
28-Jan-2015	Sweetwater	Pima	2	Adults	A
19-26 Dec 2015	Buckeye area	Maricopa	6	all imm	A
13-Feb-2016	Pintail Slough	Mohave	2	Adults	A
7 Jan-13 Feb 2017	Goodyear	Maricopa	1	Adult	A
14-Jan-2018	Phoenix Zoo	Maricopa	1	imm.	P
2-Jan-2019	TNC Shield Ranch	Yavapai	1	imm.	A
24 Jan-8 Mar 2019	Clarkdale	Yavapai	1	Adult	A
16-Nov-2019	E. Bonito Prairie Tank	Navajo	5	Adults	NS
2-Dec-2020	Prescott	Yavapai	1	imm.	A
3 Dec 2020-3 Mar 2021	Granite Reef	Maricopa	1	Adult	A
1 Jan-7 Feb 2021	Queen Valley	Pinal	1	Adult	A
12-Feb-2021	Love Lake	Navajo	1	Adult	NS

A-Accepted | P-Pending review | NS-Not submitted to ABC

The main objective of this paper is to review the criteria used to differentiate adults and immatures of Trumpeter and Tundra Swans with relevant emphasis on intraspecific variation. Field guides (e.g., Sibley 2014, Dunn and Alderfer 2017) provide detailed descriptions of Tundra and Trumpeter Swans, but they include limited information on the substantial intraspecific variation that occurs in both species. Several websites also compare the 2 swan species (e.g., Sibley 2006), but some of these sites consider only adults (McGowan and McGowan 2001, Madison Audubon Society 2021) even though immature birds can be more difficult to identify than adults. Despite progress in how field guides and websites illustrate and describe swan identification, differentiating Tundra and Trumpeter Swans can still present significant challenges.

We demonstrate key identification field marks and the difficulties that can occur in distinguishing Trumpeter and Tundra Swans through focusing on a recent example from Maricopa County, Arizona. An adult swan was observed at the Salt River Recreation Area 3 December 2020. It was joined by an immature swan on the following day. Both continued at this location until 3 March 2021 (Figure 1), providing numerous opportunities for photographic documentation. Both birds were identified by local observers as Trumpeter Swans shortly after being discovered. Later questions were raised as to whether the immature bird might be a Tundra Swan. We will first discuss the identification of the adult and then progress to challenges regarding the juvenile.



Figure 1. Adult Trumpeter Swan (left) and immature Tundra Swan (right), Salt River Recreation Area, Maricopa County, AZ, 5 December 2020. Photo by P. Deviche

## ADULT SWANS

### Bill

One of the most reliable features differentiating adult Trumpeter and Tundra Swans are the bill (coloration, size, and shape) and its relationship with the head, though they must be considered in context with other characteristics. The Salt River adult had the expected features of a Trumpeter Swan.

The bill was black with a deep orange to red edge on the lower mandible (Figure 1). In rare situations, lores of Trumpeter Swan have some yellow (Kraft 1991 cited in Sibley 2011 and in Mitchell and Eichholz 2020, Sibley 2012). In

contrast the Tundra Swan bill is typically black with a loreal yellow spot (Figure 2). However, the size of this spot is variable, some birds lack it altogether, and some Tundra Swans have red on the edge of the lower mandible like Trumpeter Swans (Figure 2).

Birders classically rely on the amount of black on the bill to separate adult Tundra and Trumpeter Swans. Black on the Tundra Swan bill typically reaches the eyes but does not form a broad connection with the eyes, as is the case in the Trumpeter Swan. As a result, in the Tundra Swan the eyes are prominent and stand apart from the bill (Figure 2). This difference is particularly useful because it can help separate Trumpeter from Tundra Swans lacking yellow lores. The black on the Salt River adult's bill formed a broad connection with the eyes, therefore, not distinct from the bill (Figure 3a).

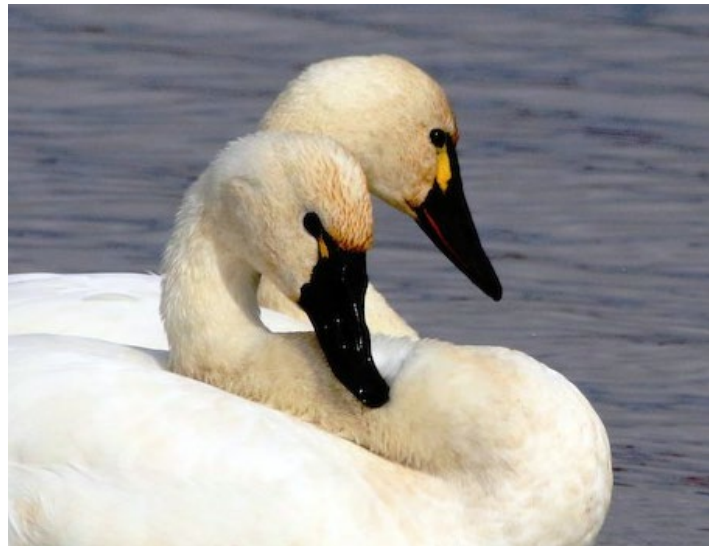


Figure 2. Profile views of the heads of adult Tundra Swans illustrating typical bill shape and coloration. Willow Lake Yavapai County, 7 December 2018. Photo by I. Davis/Macaulay Library at the Cornell Lab (ML31724801)

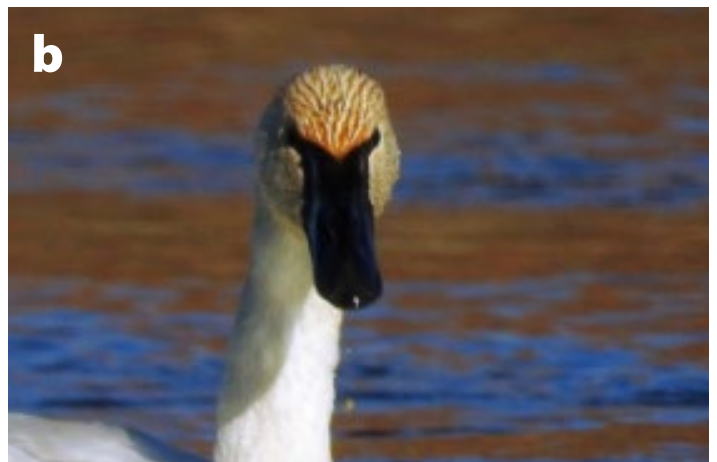
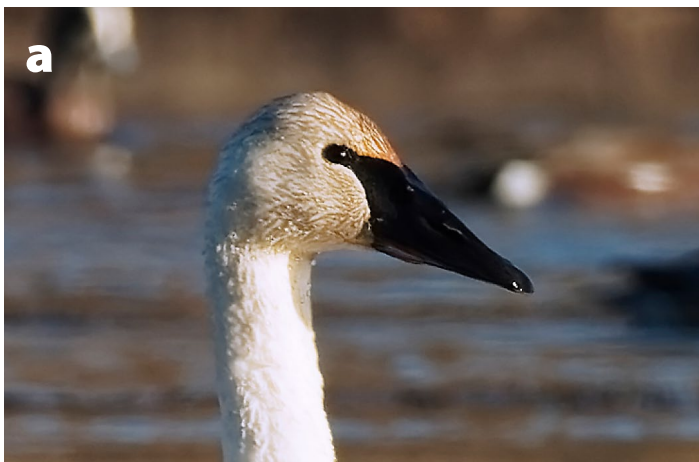


Figure 3. Profile (a) and frontal (b) views of adult Trumpeter Swan, Salt River Recreation Area, Maricopa County, Arizona, 5 December 2020. (a) Photo by P. Deviche. (b) Photo by U. Tutini/ Macaulay Library at the Cornell Lab (ML285587681)

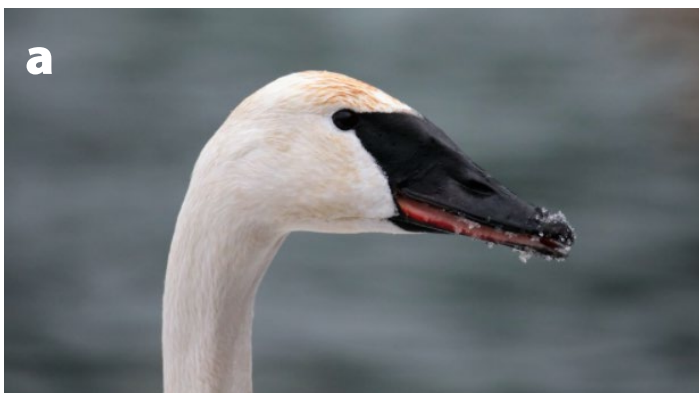


Figure 4. Profile view of adult (a) Trumpeter and (b) Tundra Swan heads. (a) Ontario, Canada, 5 February 2019. Photo by S. Rubacha/Macaulay Library at the Cornell Lab (ML397154151). (b) 18 December 2021, North Carolina. Photo by S. Mullens/Macaulay Library at the Cornell Lab (ML397490761)



The Salt River adult bird's bill was heavy in proportion to the head and its culmen formed a continuous line with the forehead (Figures 1 and 3a). In the Trumpeter Swan, at least 50 mm separate the bill tip from the anterior edge of the nares (Mitchell and Eichholz 2020; Figure 4a). Tundra Swans have, on average, a smaller bill than Trumpeter Swans. In the Tundra Swan, the culmen is slightly concave and does not form a continuous line with the forehead (Figure 2 and 4b). In most birds, less than 50 mm separate the bill tip from the anterior edge of the nares (Limpert et al. 2020).

In frontal view, the forehead feathers of the Salt River adult formed a V, with the sides of the V slightly curved inward so that the angle between the sides becomes smaller near the point (Figure 3b). Forehead feathers in adult Trumpeter Swans always form a V and not an U. However, the angle between the sides may be straight or become smaller as in the Salt River bird. In frontal view, the forehead feathers of Tundra Swans usually form a broad U (Figure 5), but this mark is variable (Figure 2). In some Tundra Swans, feathers form a concave curve where the bill meets the feathers at the gape (Sibley 2014; Figure 2). This curve is generally absent in Trumpeter Swans.

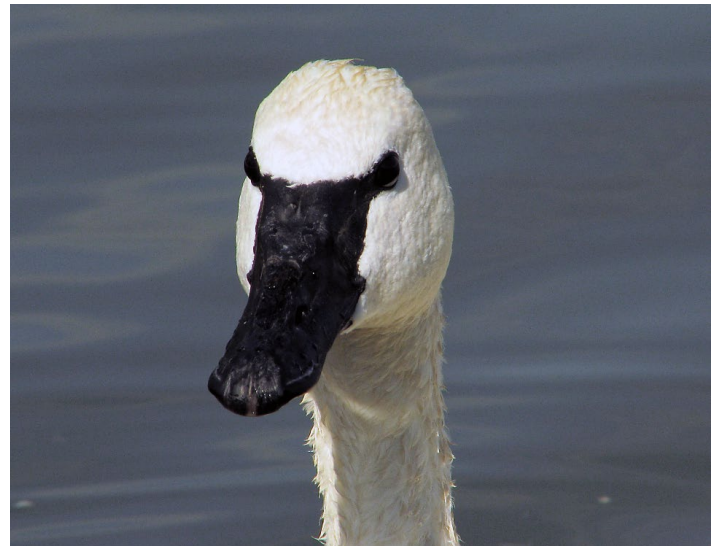


Figure 5. Forehead feathers of Tundra Swan shows U shape. Kiwanis Park, Maricopa Co., Arizona, 8 September 2008. Photo by P. Deviche

## Head Shape

In profile view, the head of the Salt River adult looks flattened, and the head shape resembles that of Canvasbacks (*Aythya valisineria*; Figures 1 and 3a). Some birds have a pronounced flat or nearly flat head for about 5.1 cm to 6.4 cm from where the forehead feathers meet the culmen to the apex near the back of the head. However, in other birds, this flat area is less pronounced and can even appear as a rather smooth curve. In addition, the head shape can look different if birds are resting or feeding, so this feature should be used with caution. Some Trumpeter Swans can exhibit an abrupt change of contour at the apex. In rare situations, the apex is near the rear of the head and well behind the eye, giving the head of these birds a "pointed" look (Figure 6).



Figure 6. Profile views of adult Trumpeter Swan heads illustrating the position of the apex, which is located in the rear of the head and well behind the eye. Left: 11 March 2012, Ontario, Canada. Photo by A. Bendall/Macaulay Library at the Cornell Lab (ML373404021). Right: 29 November 2021, Michigan. Photo by M. McNally/Macaulay Library at the Cornell Lab (ML392258851)

## Size

Trumpeter Swans (average body mass: 10.5 kg; wingspan: 2 m) are on average substantially larger and heavier than Tundra Swans (average body mass: 6.2 kg; wingspan: 1.9 m; Sibley 2014). This size difference is in most cases relatively conspicuous in the field when birds of the 2 species are viewed side by side (Mitchell and Eichholz, 2020; Figure 7). However, observers should keep in mind that the body mass of Trumpeter and Tundra Swans is sex-related (males heavier than females; Drewien and Bouffard 1994, Limpert et al. 2020) and there is overlap between the 2 species. Thus, a small female Trumpeter Swan could be of similar size to a large male Tundra Swan. In addition, limited evidence shows that Trumpeter Swan size varies geographically, increasing in the northern part of the species' range (Mitchell and Eichholz 2020). Finally, apparent size can depend on posture (e.g., birds with fluffed plumage look larger). Unless birds of the 2 species and of a same age class (adults or immatures) are seen together for direct comparison, identification based on size should be supported with other characteristics.



Figure 7. Photo comparing the relative body sizes of adult Tundra (red arrow) and Trumpeter Swans. 12 January 2014, Iowa. Photo by A. Brees/Macaulay Library at the Cornell Lab (ML41251341)

## Vocalization

Swans in Arizona usually appear in ones and twos and are rarely reported vocalizing. There are 2 recordings of the Salt River swans emitting brief notes, but it is not clear which swan is vocalizing. When swans are heard making their full calls, the vocalizations are very different and are the best way to distinguish the 2 species (Figure 8). Trumpeter Swans have a deep sonorous, honking voice, likened to a brass instrument, and may be heard from a great distance. They are especially vocal when in large groups. The Tundra Swan call is a higher pitched “woo woo” call (Madison Audubon Society 2021).

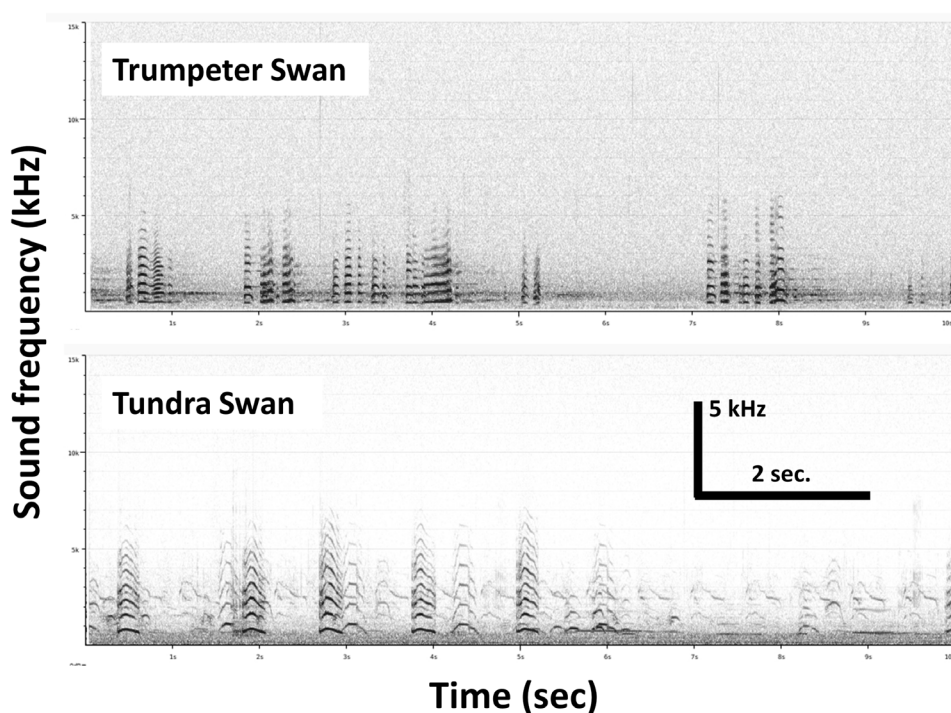


Figure 8. Typical audio spectrograms of Trumpeter and Tundra Swan calls. Trumpeter Swan: 31 December 2020, Washington. Recording by B. Lagerquist/Xeno-Canto (XC617305); Tundra Swan: 23 December 2011, Washington. Recording by A. Spencer/Xeno-Canto (XC92087)



## Summary

Careful evaluation of as many of the above characteristics as possible should lead to correct identification of most adult Trumpeter and Tundra Swans. Even then, however, identification can remain problematic. For example, birds can be too distant to properly inspect some characteristics such as the distance between the bill tip and the nares. In addition, the bill can be covered with mud and its coloration not clearly visible. Finally, and as noted above, intraspecific variation exists regarding some “classic” marks, particularly the culmen concavity and the size or even presence of the yellow loreal patch in Tundra Swans.

## IMMATURE SWANS

Separating immature Trumpeter and Tundra Swans is more difficult than distinguishing adults of the 2 species. Color differences, physiological development of bill and head, dependence of characteristics on age, and individual variation are primary sources of confusion. Differences in how rapidly some features of immature swans, even of the same species and same age, develop toward maturity can vary considerably. As the Salt River experience demonstrates, association with an adult can be a clue but must be combined with other characteristics.

### Initially identified as Trumpeter Swan

Local observers initially identified the Salt River immature bird as a Trumpeter Swan, but the bird’s appearance evolved during the next 3 months, and opinions shifted to thinking it might be a Tundra Swan. This extended period to study the same immature swan, which is rare in Arizona, offered an excellent opportunity for evaluating the differences between young Tundra and Trumpeter Swans.

It is important to bear in mind that photos can be deceiving due to angles and lighting. Initially some photos gave the impression that the immature swan was comparable in size to the adult (Figure 1). However, other early photos and early comments of at least one observer suggested a size disparity (Figure 9). A few features were consistent with the bird being an immature Trumpeter Swan, but these features can overlap with those of immature Tundra Swans. For example, the culmen of the Salt River immature swan was slightly convex suggesting Trumpeter Swan, but both swan species can have a flat, or even convex, culmen during their first year. Moreover, the immature’s bill appeared disproportionately large because it reaches adult size by the first fall (Figure 1), whereas the body does not reach full size until the second fall or later.



Figure 9. In this photo Trumpeter Swan adult (l) appears larger than imm. Tundra Swan (r). Salt River, Maricopa County, 4 Dec 2020. Photo by C. Beck/Macaulay Library at the Cornell Lab (ML285269291)

The black at the base of the bill of the Salt River swan (Figure 1) could indicate either species, especially after November. Earlier in the fall if its bill still had pink meeting the face, it would clearly be a Tundra Swan. There can be a significant difference in the distribution of black on the bill, with Trumpeter Swans typically appearing to have a bill that is “black with a pink area in the middle” (Figure 10a) whereas Tundra Swans have a “pink bill with black at the ends” (Figure 10b). However, there is enough intraspecific variation that bill coloration is not always reliable for identification. Indeed, immature swans of the same species, observed together in the field in the first fall or winter, can have different pink and black patterns to their bills (Figure 11). It is possible that such birds are not siblings and that they fledged at different times.



Figure 10. Immature (a) Trumpeter and (b) Tundra Swans in the fall. Note differences in bill coloration between the 2 species, particularly the pink base of the Tundra Swan. (a) Michigan, 7 November 2019. Photo by L. Chapin/Macaulay Library at the Cornell Lab (ML186515371). (b) Idaho, 16 November 2018. Photo by C. Roberts/Macaulay Library at the Cornell Lab (ML123801511)



Figure 11. Immature Tundra Swans, Tres Rios, Maricopa County, 19 December 2016. Sometimes immature swans of the same species, observed together in the field in the first fall or winter, will have very different pink and black patterns to their bills. Likely they are not siblings and fledged at different times. Photo by C. Kondrat-Smith



Figure 12. Second calendar year Tundra Swans. Forehead feathers in adult Tundra Swans normally form a shallow U but in immatures, they can form a sharp V as shown here. (a) Maryland, 2 May 2018. Photo by J. Stasz/Macaulay Library at the Cornell Lab (ML108159811); (b) Michigan, 14 May 2016. Photo by KBS FOC/Macaulay Library at the Cornell Lab (S28892431)



As previously mentioned, the forehead feathers of adult Trumpeter Swans form a V whereas in many Tundra Swans they form an U. This difference does, however, not always apply to immature birds: Some first-spring, all-white Tundra Swans can retain a V-shaped forehead feather pattern (see Figure 12 for examples). Thus, even though the forehead of the Salt River immature bird is V-shaped (Figure 13) and might suggest Trumpeter Swan, this feature is not sufficient to exclude Tundra Swan.

### Later identified as Tundra Swan

A key feature of the Salt River juvenile that should have pointed observers to Tundra Swan early on was the leg color. Tundra Swans have all black legs by late December or early January of their first year (M. Jordan, pers. comm.). By contrast, the legs and feet of Trumpeter Swans, are gray to black with olive yellow tinge until at least December of their second calendar year (Mitchell and Eichholz 2020). As Figures 1 and 9 show, the legs of the Salt River juvenile were all black by December of the first calendar year, ruling out Trumpeter Swan. We remind readers that as noted for adults, caution is needed when evaluating bare part coloration. Indeed, legs and feet can be covered with mud that masks their actual coloration (Figure 14).



Figure 13. Immature Tundra Swan at Salt River, Maricopa County, 4 December 2020. Forehead feathers form a V, as is the case for many Immature Tundra Swan, before they become U-shaped. Photo by T. Corman/Macaulay Library at the Cornell Lab (ML285247001)



Figure 14. Changes in apparent leg and foot coloration of the same immature Tundra Swan. Immature Tundra Swans normally have black legs and feet (b) but these can look brown when mud-covered as in (a). (a) Scottsdale, Arizona, 8 December 2020; (b) Scottsdale, Arizona, 31 January 2021. Photos by P. Deviche

Photos of the immature Salt River swan taken in early December show the juvenile's overall plumage coloration as light gray (Figure 1). This would typically signify that the bird was a Tundra Swan because juvenile Trumpeters tend to be dark sooty gray at that age. By late February the Salt River juvenile was clearly sporting a whiter plumage than typically expected for comparable-aged immature Trumpeter Swans while still retaining light gray around the head and neck (Figure 13). Darker gray than comparable-aged Tundra Swans, young Trumpeter Swans retain a gray plumage well into their first spring and summer. Tundra Swans, however, usually turn white between December and March of their first year. Consequently, by late winter young Tundra Swans generally are much whiter than age-matched Trumpeter Swans (Dunn and Alderfer 2017).



The whiteness of the Salt River juvenile by the end of February strongly suggests that it was a Tundra Swan. However, several other factors need to be considered. The timing of the first prebasic molt can vary depending on how early the juvenile fledged and where it fledged. Young swans of both species fledged in June will look different than those fledged in August. Moreover, juvenile Trumpeter Swans from the Rocky Mountains population are lighter than those from the Pacific Coast (M. Jordan, pers. comm.). Up to 13% of Trumpeter cygnets from the Rocky Mountains replace down directly with white feathers (Banko 1960, Mitchell and Eichholz 2020). These leucistic birds, therefore, acquire a plumage that is identical to that of adults during their first calendar year, and they can be distinguished from adults only by their slightly smaller size and different bill and leg color (Banko 1960). Apparent plumage coloration can also be influenced by ambient light conditions (e.g., backlit vs. direct illumination; light intensity). Consequently, the plumage of immature swans must be weighed with other characteristics.

When the Salt River juvenile swan developed a small spot of yellow lore coloration in front of the eyes in February (Figure 15), this provided additional evidence marking this bird as a Tundra. Moreover, and as already mentioned, in some photos the adult Trumpeter Swan appeared to be slightly larger than the immature swan (e.g., Figure 9), the forehead of the latter was becoming more U-shaped, and the culmen more concave. Although Trumpeter Swans can occasionally have a yellow lore area, it is rare. In the Salt River example, when put together with plumage color change, size difference, and bill shape, the emergence of a yellow lore points to the bird being a Tundra Swan.

Most descriptions of the Salt River immature swan are consistent with Tundra Swan and its proposed species reassignment was correct. The ABC has accepted the Salt River adult as a Trumpeter Swan and the immature as a Tundra Swan (G. Rosenberg, pers. comm).



Figure 15. Immature Tundra Swan (I) at Salt River, 2 March 2021, showing a small amount of yellow at the basis of the bill. Photo by D. Spangler/Macaulay Library at the Cornell Lab (ML313118571)

## CONCLUSION

In the past decade significant strides have been made toward the identification of adult Trumpeter and Tundra Swans. To distinguish these species, observers now benefit from a rich variety of field guides and online resources that present detailed comparative analyses not previously available. Separating the 2 swan species, especially immatures, is sometimes still difficult. This is particularly the case when birds are seen by themselves and/or under less-than-ideal conditions. The difficulty often results from intraspecific phenotypic variation related to age, sex, and geographic origin and such that some features are more pronounced or frequent in one species than the other, although overlap exists. To correctly identify birds, it remains essential to rely on as many of the characteristics described here as possible. Observers are also encouraged to carefully document their findings photographically. As this article illustrates, forensic analysis of photos can reveal structural and coloration details that are important for identification and could be overlooked in the field.

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