

MacGillivray's Warbler

Record Number: 95-25

2 Jun 1995

Classification: A-D

Eagle City County park, Hardin Co., IA

*Mark Proescholdt

IBL 65:100, 66:96-97; Proescholdt 1997

DOCUMENTATION

Mark Proescholdt, Box 65, Liscomb 50148 [*5/16/96]

LETTERS

Peter Pyle to Thomas H. Kent, 17 Nov 1995

Laurence C. Binford to Thomas H. Kent, 29 Nov 1995

Thomas H. Kent to Laurence C. Binford, 8 Dec 1995

REFERENCES

Field Reports: IBL 65:100

Records Committee: IBL 66:96-97

Proescholdt, M. 1997. MacGillivray's Warbler in Hardin County.

IBL 67:65.

VOTE: 6 A-D, 1 NA

A-D, I know there is some variability in the Mourning/MacGillivray complex, but this description seems to rule out Mourning.

A-D, Black bib makes this an adult male bird and the white eye crescents leave no doubt as to the identification. Adding strength to this report is one of the state's top warbler guys hearing a warbler song that he didn't recognize.

NA, Wing minus tail length is the gold standard for identification of *opornis* warblers. The combination of eye crescent, black lores, and less black in the throat than below are the best field marks for an adult male MacGillivray's Warbler. I would like to submit this record to an outside expert to see if we are using reasonable judgment in accepting this record.

A-D, In spring this plumage is diagnostic.

A-D, Hard to separate from Mourning, except males in breeding plumage are straight forward if seen well. Even broken eyering on Mournings could not be described as "like a Franklin's Gull". See Warblers of North America, Jon Curson et al. p 171.

A-D, Outstanding and diagnostic description of a species which probably wanders eastward more than other "western" wood warblers, including the statement "blackish around its eye area", which I interpret to confirm presence of dark lores, a character necessary to clinch ID of this species, along with the "vivid white eye crescents" (see Robbins and Eastèrta, Birds of Missouri, 1992). There are now 3 specimen and photographic records from the eastern quarter of Nebraska (specimen 13 Sep 1982 Boone Co. Bray et al. 1986; 1 banded, measured, photographed 20 May 1986 Cedar Co. NBR 55:41; specimen Lancaster Co. 10 May 1994 NBR 62:83) and a photograph of another in northwest Missouri (see below).

RE-VOTE (by mail): 6 A-D, 1 NA

NA, In its favor, this record has a good description, unfamiliar song, an experienced observer, and frequency of records in eastern Nebraska and northwestern Missouri. I must admit, however, that I am impressed by Mr. Binford's rather detailed analysis of the report. I don't believe that even for a

first state record, we need wait for a specimen or measurements, but perhaps we do need a more lengthy sighting with more details.

A-D, Although they would have voted differently, our two outside reviewers both suggest probability strongly favors MacGillivray's. In view of the observer's familiarity with both the plumage and the song of Mourning Warbler, I will concur with his identification.

A-D, I feel that four of the reported characters are together diagnostic beyond a reasonable doubt. The vivid white crescents are present in all MacGillivray's and only present to a lesser extent in some Mournings. The highest occurrence rate of crescents in Mournings was 16.6% in a small area. The black around the eye (black lores) is present in all MacGillivray's, but less than 30% of Mournings. The black smudge on the upper breast is also more indicative of MacGillivray's than Mourning. The unrecognized song is also a very good ID point, because this observer would recognize a Mourning Warbler song. It seems to me the probability of this being a MacGillivray's is 99% plus, and should only be rejected if we are requiring 100% certainty.

A-D, Two experts with differing opinions. I tend to agree with Pyle and, applying the standard of reasonable doubt, find nothing to contradict the ID. I wish we had some description of the call, but I feel that it is significant that Mark did not recognize it.

A-D, Strengths of this record are four features that favor MacGillivray's Warbler: eye crescents, dark lores, black smudge on lower breast, and unusual song. Weaknesses are the brief view and details of the field marks that were seen or recorded. The combination of strong, centrally thick, white eye crescents and black lores is highly suggestive of MacGillivray's, but may not be 100%. The song is apparently even more definitive than wing minus tail measurements. Mourning Warbler songs are less variable than MacGillivray's, which leads me to put more weight on the fact that Mark did not recognize the song. I would expect him to be very familiar with Mourning Warbler's song. Yet, he did not describe the song nor indicate that he listened to tapes after hearing the unusual song. The ultimate question is whether to add MacGillivray's Warbler to the state list based on a highly probable record. I am inclined to do so, if the description of the record will list the concerns expressed by Binford. I think Binford looked at the most unfavorable (and probably unrealistic) view of the statistical data.

A-D, I am inclined to agree with Pyle's analysis of the statistical probabilities. The combination of eye crescents and blackish lores is, to me, beyond a reasonable doubt. Although there are no Iowa photos or specimens, there are such from eastern Nebraska and northwest Missouri.

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*Mark Proescholdt

DOCUMENTATION

Mark Proescholdt, Box 65, Liscomb 50148

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95-25

SNOWY PLOVER AT SAYLORVILLE RESERVOIR

STEPHEN J. DINSMORE

On 3 May 1996, I saw a Snowy Plover at the Oak Grove Beach Recreation Area of Saylorville Reservoir in Polk County. I studied and photographed the bird at distances as close as 20 m between 10:00-10:21 a.m. When I arrived at the beach, I noted a distant pale shorebird near the water which I thought was probably a Piping Plover. I left the bird for a couple of minutes to look at some Sanderlings, after which I couldn't immediately relocate the bird. Several minutes later, I found the bird high up on the beach. As soon as I put the scope on the bird, I recognized it as a Snowy Plover (Fig. 1). Overall, the bird was very pale. The upperparts were a pale, sandy brown. When viewed from behind, the bird had a narrow white collar and the crown appeared buffy and contrasted with the mantle. The underparts were white. The forehead was white with a small black patch on the forehead. The bird also had a small black auricular patch and a black "slash" mark



on each shoulder. The bill was very thin, black, and had a slight upturned appearance. The legs were grayish, and the bird seemed long-legged for its size. Throughout the observation, the bird's upright posture and very active foraging behavior were distinct. Based on the brightness of the plumage and black head markings, I sexed the bird as an adult male. Other birders did not relocate the bird later in the day.



Fig. 1. Snowy Plover, Saylorville Reservoir, 3 May 1996. Photo by Stephen J. Dinsmore.

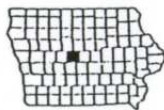
This is the fifth record of a Snowy Plover for Iowa. Previous records are all from spring: 6-7 May 1988 at Bays Branch Wildlife Area, Guthrie County (Dinsmore and Fix, *Iowa Bird Life* 58:86-87, 1988), 22 May 1988 at Dunbar Slough, Greene County (Dinsmore and Fix, *Iowa Bird Life* 58:86-87, 1988), 28 April 1990 near Burlington, Des Moines County (*Iowa Bird Life* 62:21), and 10-13 May 1992 at Riverton Wildlife Area, Fremont County (*Iowa Bird Life* 62:76, two birds).

4024 Arkansas Dr. Ames, IA 50014

PINYON JAY IN BOONE COUNTY

LLOYD AND GAYLAN CRIM

At 7:45 a.m. on 30 November 1996, while watching a flock of Blue Jays at our bird feeder, we noticed one "odd" bird. After checking the bird book, we decided it was a Pinyon Jay. We then called Jim Dinsmore who came to see it. After he arrived, all three of us were able to observe it returning to the bird feeder three times in the next several hours.



The bird was roughly the size of a Blue Jay, with a shorter tail and a longer, thinner, slightly curved beak (Fig 1.). In color, it was mostly gray with some light bluish-gray color on the head, tail, and edges of the wings. It had a white throat patch, but lacked the streaking an adult should have, and was labeled a juvenile by some of the many visitors who came to see it. It walked rather than hopped, and mingled with the Blue Jays as one of them. Its visits to our feeders were fairly

regular at first, becoming more erratic as the season progressed and the snow melted. It seemed to prefer the peanuts, but occasionally took sunflower hearts, even hanging from a "super ball" feeder to do so. It was last observed on 22 March 1997.



Figure 1. Pinyon Jay in Boone County, 6 December 1996. Photograph by Thomas H. Kent.

This is only the second report of this western species in Iowa, the previous report being one seen at Shenandoah from December 1972 to January 1973 (Zollars, *Iowa Bird Life* 43:28-29, 1973). To our knowledge, this is the furthest east report of this species.

1750 140th St., Boone, IA. 50036

MACGILLIVRAY'S WARBLER IN HARDIN COUNTY

MARK PROESCHOLDT

On 2 June 1995, I stopped at Eagle City County Park along the Iowa River Greenbelt in north Hardin County. I heard a loud unfamiliar warbler song in a brushy tangle along the park's edge. There were several birds in the tangle. I heard one or two loud "chip" notes then zeroed in on the area of the chips. Then a warbler popped out into view about eight feet up in the tangle. It looked like a breeding-plumaged male Mourning Warbler. It was yellow underneath, had a dark green back, and a dark gray hood with a definite black smudge on its upper breast. It was blackish around its eye area. But it had very vivid white eye crescents above and below its eye like a breeding-plumaged Franklin's Gull would have. I had a very good look at it for approximately five seconds, and it was a broken white eye-ring that was incomplete both in front of and behind the eye. I was very surprised! The bird moved, and I did not see it again. The unfamiliar song continued, but I was unable to find the singing bird. Then lack of additional time forced me to leave. Although I had only a brief view of the bird, the presence of the incomplete eye ring made it clear that this was a MacGillivray's Warbler, a western species that otherwise might be confused with a Mourning or Connecticut warbler. This is the first accepted record for Iowa of a MacGillivray's Warbler.



Box 65, Liscomb Iowa 50148

What species? MacGillivray's Warbler How many? 1Location? Eagle City Co. Park - (North Hardin County)Type of habitat? Brushy tangle along park's edge up the hill from Iowa River GreenbeltWhen? date(s): June 2, 1995 time: 11:15 a.m. to for approximately 5 secondsWho? your name and address: Mark Proescholdt, Box 65, Liscomb, Iowa 50148others with you: noneothers before or after you: none

Describe the bird(s) including only what you observed. Include size, shape, details of all parts (bill, eye, head, neck, back, wing, tail, throat, breast, belly, under tail, legs, feet). Also mention voice and behavior.

I had stopped along the edge of this tangle and was standing and trying to find what bird was singing this unfamiliar warbler song. There were several birds in the tangle. I heard one or two loud "chip" notes then and zeroed in on the area of the chips. Then out into view popped a warbler 8'-9' high ^{in the tangle}. It was like a breeding-plumaged Mourning Warbler. It was yellow underneath, had a dark green back, and a ^{dark} gray head with a definite black smudge below the gray hood on its upper breast. It was blackish around its eye area. But it had very vivid white eye crescents above and below its eye like a breeding-plumaged Franklin's Gull would have. I had a very good look at it and it was a broken white eye-ring that was incomplete both in front of and behind the eye. I was very surprised! The bird moved and I did not see it again. The unfamiliar song continued and I tried to find the bird singing but didn't, and then I had to go.

In "Spring" this should not be mistaken for any other warbler. A ~~or~~ Mourning warbler lacks the vivid eye crescents. A Connecticut warbler has a complete white eyering and no black smudge on the upper breast and the gray head is a lighter gray color. In "fall" the female and immature Mourning Warblers may show a thin, nearly complete eyering (which I have seen on Mournings in the fall), but this could not be mistaken for the vivid white. Similar species and how eliminated: eye crescents of this breeding-plumaged male MacGillivray's warbler along with its very noticeable black smudge on its upper breast below its gray head.

Did any one disagree or have reservations about identification? _____

If yes, explain: _____

Viewing conditions: give lighting, distance (how measured), and optical equipment: Cloudy, it was somewhat dark lighting, Bird was 20 feet away estimated, 8X30 Binocs

I had very good looks at the warbler.

Previous experience with species and similar ones:

Have seen a few MacGillivray's out west. Have seen many Mournings and quite a few Connecticut in Iowa.

References and persons consulted before writing description:

Natl. Geog. guide, Robbins' guide, Peterson's guide, Audubon Master Guide, Iowa BirdsHow long before field notes made? Right after this form completed? June 3, 1995
Seeing the bird

95-25

Thomas H. Kent
IOU Records Committee
211 Richards St.
Iowa City, IA 52246

SE Farallon Is.
17 November 1995

Dear Tom,

Thanks for letting me see the two Iowa records of MacGillivray's Warblers. Unfortunately, I have a lot less experience with spring male *Oporornis* than I do with fall immatures. I have only seen two adult male Mourning Warblers here in the past 15 years and my experience with them prior to that was fairly limited as well. I believe, though, that most MacGillivray's and Mourning warblers are readily distinguished in any plumage, particularly that of adult male. It usually comes down to how many different criteria were documented and how, when combined, these serve to rule out the other species.

I have never seen an adult male Mourning Warbler with white around the eye, in life or as a specimen (50-100 examined), and I believe that this condition must be quite rare (it probably indicates an SY bird). Pitocchelli (1990, Auk 107:161-171), indicates that he only had one or two Mournings out of a sample of 267 (0.3-0.7%) that had "full" arcs as is found in MacGillivray's (see also his Birds of North America account, #72, which I believe has more on this). Additionally, only about 33% of adult male Mourning Warblers had dark lores so the chances of a Mourning having both full eye arcs and dark lores would be < 0.2%. I would presume this chance of error to be negligible enough to accept the recent record (95-25), where both of these characters were noted. The black smudge on the breast does not seem well enough described to give support to the record, although what is written fits MacGillivray's.

The bird of the older record (81-EB) does not appear to be well-enough described to eliminate the possibility of an aberrant Mourning Warbler. I would interpret "two white spots" as possibly inferring "weak" eye crescents, which Pitocchelli found in about 6-8% of his birds. Since this was basically the only field mark noted (the breast description is too vague) I would judge this chance of error to be too high for acceptance. I'm unfamiliar with your standards of acceptance but, were these California records, I would vote to accept 25-95 and reject 81-EB.

I respect the caution noted by Binford and DeSante but would have to point out their sentence following that in which you have highlighted. It would seem that any spring male *Oporornis* with strong eye crescents has a very high chance of being a MacGillivray's and any additional marks noted (black lores, restricted mottled bib, or white chin) should clinch it. To not accept such records (with such low probabilities of error) might result in practically nothing being accepted.

Hope this helps.

Sincerely,



Peter Pyle

Arctic Alaska Antarctic Eastern Pacific Ocean All Western States Mexico Mono Lake

1860 Boulevard de Province, #44
 Baton Rouge, LA 70816
 29 November 1995

Thomas H. Kent, Secretary
 Iowa Records Committee
 211 Richards Street
 Iowa City, IA 52246

Dear Tom:

Having been on the California Bird Records Committee for 15 years and dealt with other rarities committees, I know you are hoping I can solve your problem. I cannot and doubt that anyone can with our present knowledge. As noted in Binford and DeSante (1993), I suspect that if someone would analyze suites of field characters in these two species, we might have character sets that would identify at least some birds. But no one has done this, leaving us with three non-diagnostic field characters (eye-arcs, lores, and breast patch) and one diagnostic in-hand character (wing minus tail).

An ornithologist, not wanting to confuse the literature by accepting less-than-100% records, would reject both your birds, because both lack wing minus tail measurements. I agree with this approach and for this reason and others given below, reject both records. If you were to accept #95-25, you would have only about an 83.4% chance of being correct, at least in regard to the presence of eye-arcs, because of what J. Pitocchelli (1990, Auk 107:161-171) says, namely that male Mournings in Ontario breeding grounds often have eye-arcs: 11.1% at Dorion, 14.2% at Geraldton, and 16.6% at Cochrane. He goes on to say: "Eye-arcs in Mourning Warblers are usually weak, but some extreme specimens may resemble full eye-arcs of MacGillivray's Warbler." Unfortunately, he does not say what percentages have full eye-arcs as opposed to small spots or narrow arcs. Further, he says "If, in spring, males east of the Rocky Mountains do not possess eye-arcs and dark lores, then they are Mourning Warblers. If they possess both, then refer to the song type (if possible) and the W-T measurement." In other words, spring males east of the Rockies cannot be identified without song or measurements.

I have not seen such Mournings either in the field nor in museums. I suspect that birds with full, pure white crescents (meaning wider in the middle than at the ends), jet black lores, and anything other than a full black breast apron, have about a 99% chance of being Macs; but this is only surmise, and right now I must go with the literature. The width of the black over the bill is also important in my opinion, but is not mentioned by the people who have studied these species in most detail. The white chin mark mentioned in Binford and DeSante might be visible in the field in extreme individuals seen under ideal conditions.

Keep in mind, too, that the two species hybridize occasionally, further complicating the picture.

As for your two specific records:

81-EB, 16 May 1966. (1) "Two white spots above and below the eyes" is not good enough, as Mourning can have "spots" in the adult male (Hall 1979 and Pitocchelli 1990). Pure white crescents (wider in middle) must be seen, in my opinion. (2) Lores are not mentioned. (3) "Breast...dappled with very black crape markings" does not sound like an apron, which might be good for Mac, though I don't know what "crape" means here. (4) No measurements. In fairness to the observer, few people were taking descriptions in 1966, as there were no rarities committees to submit them to, and even American Birds editors rarely required descriptions. Nevertheless, I must reject, not only because of the lack of measurements, but because the rest ~~of~~ the

description is too sketchy.

#95-25, 2 Jun 1995. (1) The duration of the sighting--5 seconds-- seems too short for such a rarity. On the other hand, I know an expert birder can see a lot in that time, especially when forewarned by the song. Still.... (2) The fact that he did not recognize the song suggests Mac, but there is no description of it. (3) "Blackish" around the eye area is not good enough for me. This area should be jet black. "Blackish" suggests it was not black but very dark gray. You could ask the observer, but retrospective descriptions are rarely accurate. (4) The eye crescents sound good for Mac, being "vivid (I assume this means pure or untinted) white. I would have preferred he tell us that he knows the difference between crescents (wider in the middle) as opposed to arcs, which need not be wider. In any event, Mournings can have at least arcs, as noted above, and the percent of birds with arcs reaches 16.6% in at least one locality. (4) Breast. I'm not sure what is meant by "black smudge", as an apron could, I suppose, be called a smudge. Nevertheless, this sounds more like Mac, as Mourning, by 2 June, should have an apron. Again, this description leaves a little to be desired. (5) Most important, there is no wing minus tail measurement. In short, this probably was a Mac, but no diagnostic mark was seen, there is no measurement, and the given description leaves questions in my mind as to what the bird really looked like, especially as seen for only 5 seconds.

I think Iowa, like other states, should await a specimen or in-hand bird that is photographed and carefully measured (this is critical, and all too many banders do not measure correctly or carefully enough).

I hope these remarks are of use to your committee.

Good birding!

Laurie

Laurence C. Binford, Ph.D.

95-25

December 8, 1995

Lawrence C. Binford, Ph.D.
1860 Boulevard de Province, #44
Baton Rouge, LA 70816

Dear Laurie:

Thanks for your prompt and detailed review of the Iowa MacGillivray's Warbler records.

Your analysis will be quite helpful in our review of these records.

In your article (Binford and DeSante 1993) you list MacGillivray's Warbler as casual in Missouri based on reference to DeSante and Pyle (1986). Robbins and Easterla (*Birds of Missouri*, 1992, copy of pages 303-304 enclosed) consider it only accidental based on one record. That record is based on a photograph of a bird netted very near the Iowa border in 1974. The identification was verified by J. Pitocchelli and G. Hall. Two of your "valid" records from Massachusetts were "seen", which suggests that they were not based on the "gold standard" of wing-minus-tail measurement.

I personally have mixed feelings about accepting birds with less than 100% specificity. On the other hand, requiring 100% specificity produces a very low sensitivity (to use laboratory medicine terminology). One would expect that MacGillivray's would be an eastern vagrant just like other western warblers. Should we underestimate this vagrancy because of severe identification problems?

I've been tough on the Iowa state list, voting to take a number of species off the list over the years since 1980. But I wonder sometimes whether the "state list" is that important. Would accepting sight records of MacGillivray's Warblers based on detailed documentations increase our database on "MacGillivray's-like" warblers? Or would such records be entirely useless?

I hope I am not out of line in sharing Peter Pyle's analysis with you and yours with him. The two of you seem to have come to different statistical conclusions based on Pitocchelli's data. That, of course, doesn't mean that either of you is wrong.

Both of you have indicated an understanding of the philosophical nature of the problem, and our committee understands that too. We, however, greatly appreciate your taking the time to discuss it with us.

Sincerely,

Thomas H. Kent, Secretary
IOU Records Committee
211 Richards Street
Iowa City, IA 52246

cc: Peter Pyle

Hybridization between Mourning and MacGillivray's Warblers.—From 6 June to 31 July 1963 I surveyed the distribution of the Mourning Warbler, *Oporornis philadelphia*, and MacGillivray's Warbler, *O. tolmiei*, in the foothill region of southwestern Alberta. The objective of this survey was to determine if a zone of contact or overlap of these two species occurs in this region, and, if so, whether or not hybridization occurs. Bent (U. S. Natl. Mus., Bull. 203, 1953, pp. 531-540) states that in Alberta the breeding range of the Mourning Warbler probably extends west to Grande Prairie, Glenevis, Camrose, and Nevis, while that of the MacGillivray's Warbler probably reaches east to Lesser Slave Lake and Edmonton (Figure 1), suggesting that range contact or overlap occurs in this region. My survey was confined to an area from the latitude of Edmonton on the north to the Sheep River south of Calgary on the south, and from a line through Stettler and Drumheller on the east to the Jasper-Banff Parks region on the west. Within these boundaries I drove roads passing through forest, brushland, or riparian forest and checked suitable habitat for the presence of singing males.

The distinctive plumage characteristics of the Mourning Warbler are its gray hood and absence of darkened lores or white eyelid markings. The male has an apron of black on the upper breast. MacGillivray's Warbler has a gray hood without a black apron in the male, prominent white upper and lower eyelid markings, and, in the male, heavily blackened lores (Griscom and Sprunt, *The warblers of America*. New York, Devin-Adair, 1957). I collected 31 specimens at 7 localities and examined their major plumage characteristics to determine if variation suggestive of hybridization occurs. Because of the small number of specimens obtained, I felt that a detailed analysis was not justified at this time. I examined the specimens with particular respect to the characteristics of eyelid markings, black apron, and lores. Populations were considered "pure" if no specimens showed a mixture of characteristics of the two species.

Apparently pure populations of Mourning Warblers range west of Edmonton as far as a point on the McLeod River about 4 miles east of Edson, Alberta, and south of Edmonton as far as a point on the Red Deer River 9 miles east of Red Deer, Alberta. I found pure populations of MacGillivray's Warblers at the University of Alberta Biological Station on the Sheep River, southwest of Calgary, and at the Tolman Ferry on the Red Deer River east of Trochu, Alberta (Figure 1).

Mixed populations or populations containing apparent hybrids were present at three locations. On the Bow River near the town of Kananaskis, one male and one female MacGillivray's Warbler and one female Mourning Warbler were collected at a single mist-netting locality. At a point on the Upper Saskatchewan 6 miles west of Rocky Mountain House, and at a point on the Clearwater River 17 miles west of Caroline, Alberta, the populations contained both pure Mourning Warblers and apparent hybrids. I collected a total of 5 males, 4 of which showed hybrid characteristics, at the Upper Saskatchewan locality, and 2 males, one of which showed hybrid characteristics, at the Clearwater River locality.

The presumptive hybrid obtained on the Clearwater River showed eyelid spots and black lores typical of a MacGillivray's Warbler and a black apron characteristic of a Mourning Warbler. The four specimens from the Upper Saskatchewan differed in characteristics. Two were similar to Mourning Warblers except for slight to moderate development of eyelid spots. One was similar to a Mourning Warbler except for slight development of eyelid spots and presence of very black lores. The last was similar to a Mourning Warbler except for slight development of eyelid

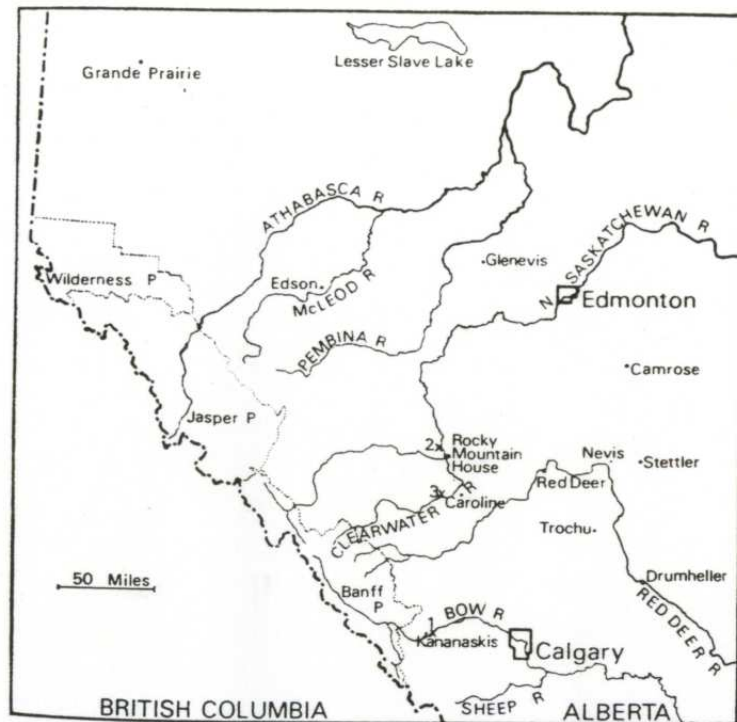


Figure 1. Southern Alberta, showing localities mentioned in report. Numbered localities are those at which individuals of both species (1) or presumptive hybrids (2, 3) were obtained.

spots and the absence of a black breast patch. These specimens have been placed in the vertebrate collection at California State University, San Diego.

Hybridization between these species has not heretofore been reported (Cockrum, *Wilson Bull.*, 64: 140, 1952). John and J. M. Macoun (*Catalogue of Canadian Birds*, Ottawa, Government Printing Bureau, 1909) report the taking of a possible hybrid at the Great Falls of the Saskatchewan River. This specimen is not described, and as this location is much farther east in the province of Saskatchewan, it is unlikely that it could have come from a nearby population in which hybridization was occurring.

The distribution pattern suggests that in southern Alberta the ranges of the two species do not overlap in the true sense, but rather contact each other occasionally, with some hybridization probably occurring between species at these contact points.

I am indebted to Victor Lewin and John Holmes of the University of Alberta, who made available the facilities of the University of Alberta Biological Station and gave valuable suggestions on collecting localities. This work was supported by Grant No. 3121 from the Penrose Fund, American Philosophical Society.—GEORGE W. COX, *Biology Department, California State University, San Diego, California 92115*. Accepted 17 Nov. 71.

Table 3: Peregrine Productivity in the Chicagoland Area

Site	1987	1988	1989	1990	1991	1992
125 S. Wacker Chicago, IL	1 egg 0 hatch 0 fledge	3 eggs 2 hatch 2 fledge	4 eggs 2 eggs* 0 hatch 1 hatch 1 fledge	4 eggs 3 hatch 0 fledge	4 eggs 2 hatch 0 fledge	4 eggs 3 hatch 3 fledge
Evanston, IL			? eggs ? hatch 2 or 3 fledge			
East Chicago, IN			? eggs ? hatch 3 fledge	? eggs 3 eggs* 0 hatch 2 hatch 2 fledge	? eggs ? hatch 1 fledge	? eggs 4 hatch 2 fledge
Gary, IN				? eggs ? hatch at least 1 fledge	4 or 5 eggs 3 hatch 2 fledge	4 eggs 2 hatch 1 fledge
Brit Centre Chicago, IL						? eggs 0 hatch 0 fledge

* second nest attempt after first failed

First Illinois Record of MacGillivray's Warbler, with a Summary of Eastern North American Records and Notes on Identification

By Laurence C. Binford and David F. DeSante

While conducting research at the Field Museum of Natural History, Chicago, each of us independently discovered a specimen of MacGillivray's Warbler (*Oporornis tolmiei*) that represents the first valid record for Illinois (Bohlen 1989). It is an adult male study skin (FMNH 150937) collected by Dr. W. S. Strode on 15 May 1915 at Lewistown, Fulton County. Originally identified by Strode as a Connecticut Warbler (*O. agilis*), the bird was later cataloged into the L. B. Bishop collection (No. 27457) as a MacGillivray's, and finally (1942) into the Field Museum as a Mourning Warbler (*O. philadelphia*).

The specimen is a typical adult male MacGillivray's Warbler in all

respects. We find no evidence of hybridization with the Mourning Warbler (see Cox 1973, Patti and Myers 1976, Hall 1979). The flattened wing measures 58.3 mm and tail 53.5 mm, giving a wing-minus-tail value of 4.8, which is in the lower range for male MacGillivray's (range 2-14.6) and well below the minimum for Mourning (10-18) or Connecticut (20-27) (Lanyon and Bull 1967, Kowalski 1983). The tail measurement is greater than the maximum, 53 mm, for 65 male Mournings and close to the mean of 54.3 mm for 87 MacGillivray's (Lanyon and Bull 1967). Kowalski (1983) gives 50.5 mm as the mean for his smaller sample of MacGillivray's.

The specimen's plumage also matches *tolmiei* in the characteristics classically used to differentiate the

two species (but see below). Two widely separated, pure white crescents border the eye, one above and one below; each measures about 3 mm long and is widest in the middle. The lores are jet black and form a band 1.9 mm wide at the base of the culmen. The lower throat and upper breast feathers are basally black and widely tipped with white, making this region only moderately darker than the upper throat.

In contrast, most spring adult male Mournings have no white adjacent to the eye; medium to dark gray lores, usually not, or only very narrowly, meeting over the bill; and lower throat and upper breast feathers that, by 15 May, are extensively black, narrowly margined with whitish, forming a black "apron."

on his other specimens) and quite legible. According to David S. Boyd (in litt.) of the Lewistown Chamber of Commerce, W. S. Strode resided in Lewistown from 1895 to 1923. He was a locally renowned naturalist and avid collector, especially of bird eggs and shells, and at one time operated a small natural history museum in Lewistown. The Field Museum received a collection of fresh-water mussels from him in 1900. Interestingly, he probably was the character "Theodore the Poet" in Edgar Lee Masters' Spoon River Anthology.

MacGillivray's Warbler breeds throughout much of western North America and winters from northern Mexico south to Panama. It migrates east casually to Minnesota, Missouri, and Louisiana (DeSante and Pyle 1986). A search of the literature, as well as inquiries to records committees and/or local experts in all states and provinces east of the Mississippi River, revealed only five other apparently valid records, four from Massachusetts and one from Georgia (see Appendix). Fourteen other eastern records of supposed MacGillivray's Warblers have been discredited or are (at this writing) of questionable validity. These are from Missouri, Indiana, Ontario, Connecticut, Massachusetts, Maryland, and New Jersey (see Appendix).

We have not attempted subspecific identification of the Illinois specimen. The four named races (Phillips 1947) are exceedingly difficult to separate. Two were not recognized by the A.O.U. (1957), and the species is probably best considered monotypic (B. L. Monroe, Jr., in litt.).

Acknowledgements

We thank the following heads of rarities committees and other experts for data on the status of MacGillivray's Warbler in eastern states and provinces: K. P. Able, J. L. Baker, L. Balch, M. V. Barnhill, L. R.

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Appendix

Valid Records

Four records of MacGillivray's Warbler for Massachusetts have been accepted by Veit and Petersen (ms; Petersen in litt.), although they have yet to be reviewed by a records committee. Single birds were banded in Lexington on 15 November (present 13-29 November) 1977 (P. Martin, R. H. Stymeist, et al.; photo by S. A. Perkins) and at Manomet on 21 October 1991 (T. Lloyd-Evans and Manomet Bird Observatory staff). Singles were seen at Nantucket on 23 November 1978 (R. R. Veit, S.

Perkins, M. Lichfield) and at Peabody from 12 to 14 October 1990 (R. Heil et al.). In Georgia a bird banded, measured, and photographed by D. and D. Cohrs and A. Wyand at Jekyll Island Banding Station on 2 October 1987 was accepted by the state's rarities committee; measurements were flattened wing 57 mm, tail 50 mm, and wing-minus-tail 7 mm (P. Brisse in litt.). Another possible MacGillivray's, seen by R. Manns (in litt.) on 4 November 1987 in Atlanta, Georgia, has not yet been reviewed by the state committee.

Questionable Records

Other eastern records of supposed MacGillivray's Warblers have been discredited or are (at this writing) of questionable validity. A "possible... record" of a singing bird in the St. Louis area, 21-22 May 1950 (Graber and Graber 1983) pertains to Creve Coeur Lake, St. Louis Co., Missouri, is undocumented, and is not generally accepted (R. Goetz, Illinois Ornithological Records Committee, in litt.). A specimen now in the British Museum collected by H. K. Coale at Wolf Lake, Lake Co., Indiana, on 1 June 1876 (Ford 1956, A.O.U. 1957) has been re-identified as a Mourning Warbler (Mumford and Keller 1984). A bird banded and released at Noblesville, Hamilton Co., Indiana, on 29 May 1924 (Brooks 1925, A.O.U. 1957) was inadequately described and had not been accepted by recent authorities (e.g. Mumford and Keller 1984, Keller et al. 1986). An adult male collected (American Museum of Natural History No. 507395) at New Haven, Connecticut, on an unspecified day in May 1890 was accepted by Lanyon and Bull (1967) but currently is being questioned (on provenance and identification) by that state's rarities committee (L. R. Bevier, in litt.). A bird that visited a feeder in Waltham, Massachusetts, from 3 February to 26

April 1939 (Griscom 1939, Lanyon and Bull 1967) was never satisfactorily identified and was not even mentioned by Griscom and Snyder (1955) nor accepted by Veit and Petersen (ms). A bird banded at Kent Point, Kent Island, Queen Anne's Co., Maryland, on 6 October 1964 (Kaestner 1966, E. Wilson in litt.) was not measured or described, and this species was not listed for Maryland by Bystrak and Robbins (1977). New Jersey has had four reports of possible MacGillivray's Warblers: one banded and measured at Troy Meadows on 12 September 1976; one netted and photographed at Island Beach State Park on 28 May 1979; one banded at Brigantine National Wildlife Refuge on 1 June 1965; and one banded 3 miles southwest of New Brunswick on 18 September 1984. Leck (1984) tentatively accepted the first two records, but the banders themselves questioned the Brigantine (Hailman 1968) and Troy Meadows records, and none of the four has yet been accepted by the New Jersey Bird Records Committee (K. T. Karlson in litt.). For Ontario an adult male specimen in the American Museum of Natural History (No. 507393) was taken by an unstated collector supposedly at Hamilton on 20 May 1890 (Lanyon and Bull 1967, Speirs 1985, James 1991). However, this record has not yet been reviewed by the Ontario Bird Record Committee, and its provenance has been questioned; three other Ontario records have been rejected by the committee (A. Wormington in litt.). ♣

Earliest dates: 1, 14 or 15? Aug 1974, St. Louis (JE-NN 46:105); 1, 1 Sept 1969, Maryville (MBR). High count: 2, tower kill, 10–11 Sept 1964, Kansas City (DAE-BB 31[4]:18). Latest dates: 1, 13 Oct 1983, Marais Temps Clair (M. Scudder, F. Ruegsegger-NN 55:91); 1, 9 Oct 1938, St. Charles Co. (WS-BB 5[11]:103).

Mourning Warbler (*Oporornis philadelphia*)

Status: Uncommon transient.

Documentation: Specimen: o?, 14 Sept 1918, Lexington, Lafayette Co. (CMC 361).

Habitat: Dense thickets, especially at woodland and forest edge.

Records:

Spring Migration: Like the preceding species this is a late migrant. The first birds appear by the second week of May and peak during the last ten days of the month. An average of 0.2 birds was recorded at Forest Park between 8–25 May 1979–90 (RK; n=243 hrs). Earliest dates: 1, 27 Apr 1981, St. Louis (B. Hely-NN 53:39); 1, 28 Apr 1935, Hahatonka, Camden Co. (IA et al.-BB 2[4]:22). High counts: 15, 30 May 1963, St. Louis (Hanselmann 1963); at least three counts of 6 birds from both sides of the state.

Summer: There are a number of observations of late migrants for the first week of June. Latest dates: 1, 9 June 1945, Hannibal, Marion Co. (WC-AM 47:38); 1, 9 June 1981, St. Louis (A. Roth-BB 48[3]:25). In addition, there is a single July record, presumably of a very early fall migrant: 1, 30 July 1977, Roaring R. SP (JG-BB 44[4]:31).

Fall Migration: The first arrivals are detected at the end of Aug. Apparently, peak is during mid-Sept, with an occasional bird observed during the first few days of Oct. Earliest dates: 1, 16 Aug 1979, Big Oak Tree SP (JH); 1, 25 Aug 1970, Maryville (MBR). High counts, tower kills: 9, 20–21 Sept 1963, Columbia (George 1963); 5, 10–11 Sept 1964, Kansas City (BB 31[4]:18). Latest dates: 1, 7 Oct 1980, Springfield (CB-BB 48[1]:9); 1, tower kill, 6 Oct 1962, Cape Girardeau (Heye 1963).

Comments: Purported hybrids between this species and the MacGillivray's Warbler have proved to represent extreme plumage variants of pure birds (Pitocchelli 1990). Most of these have been Mourning Warblers that resemble MacGillivray's. Spring males encountered in Missouri that do not possess eye-arcs and dark lores are Mourning Warblers. Song is diagnostic, and wing minus tail measurements separate all but the extreme plumage variants (Pitocchelli 1990).

MacGillivray's Warbler (*Oporornis tolmiei*)

Status: Accidental spring transient.

Documentation: Photograph: male, netted, 1 May 1974, extreme north-

ern Atchison Co. (F. and H. Diggs; VIREO x05/1/020; Fig. 29).

Habitat: Same as that of the Mourning Warbler.

Comments: The identification of the above photographed bird was verified by experts (J. Pitocchelli, G. Hall) familiar with the morphological variation in Mourning and MacGillivray's warblers. See comments under Mourning Warbler.

Common Yellowthroat (*Geothlypis trichas*)

Status: Common summer resident; very rare winter resident.

Documentation: Specimen: male, 4 May 1974, Maryville (NWMSU, JWG 17).

Habitat: Marshes, wet, tall meadows, and thickets bordering water.

Records:

Spring Migration: In the southeast the initial migrants arrive during the second week of Apr but not until the beginning of the fourth week in the north. Peak is during the first and second weeks of May in the south and north, respectively. Earliest dates: 1, 12 Mar 1990 (winter resident?), Mingo (BRE); 1, 13 Mar 1987 (winter resident?), Duck Creek (BRE). High count: 15, 18 May 1963, St. Louis (Hanselmann 1963).

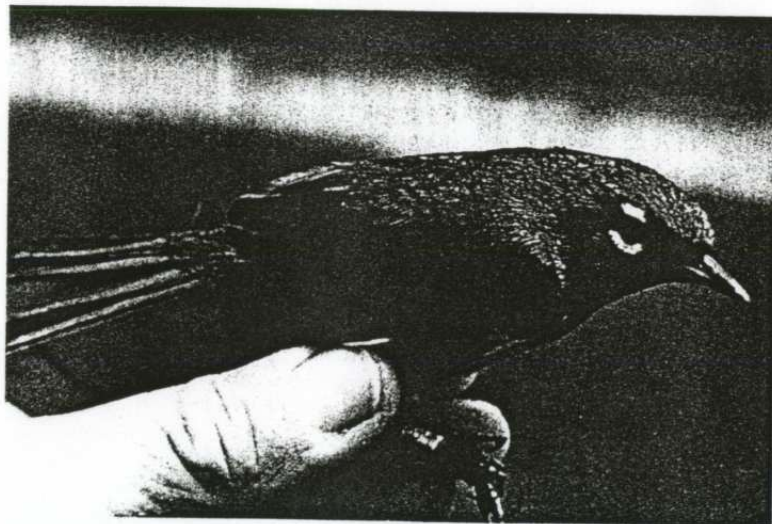


Fig. 29. This male MacGillivray's Warbler was netted and photographed by Fitzhugh and Hazel Diggs on 1 May 1974 in northern Atchison Co. It represents the only record for the state.

PLUMAGE, MORPHOMETRIC, AND SONG VARIATION IN
MOURNING (*OPORORNIS PHILADELPHIA*) AND
MACGILLIVRAY'S (*O. TOLMIEI*) WARBLERS

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ABSTRACT.—Mourning (*Oporornis philadelphia*) and MacGillivray's (*O. tolmiei*) warblers are currently recognized as distinct species (AOU 1983). The specific status of these taxa, however, has been questioned based on morphological similarity and reports of hybridization in central Alberta (Cox 1973). I investigated the distinctness of these taxa by comparing plumage, skeletal, and primary song characters from fresh collections and recent tape recordings from the allopatric portions of their breeding ranges and the potential contact areas. The plumage analyses revealed overlap in characters originally used to diagnose these taxa; however, the incidence of extreme specimens was low. Separate multivariate analyses of morphological and song characters showed that the taxa are essentially distinct in multivariate space with little or no overlap. The Mourning Warbler was larger for most skeletal characters and had lower song frequencies. Plumage characters originally used to diagnose these taxa separate a majority of specimens, but they are ineffective for distinguishing extreme variants or hybrids. Song type proved 100% reliable in discriminating between taxa. I found no hybrid contact between these taxa. Furthermore, specimens collected near the potential contact zones were as variable morphologically as specimens from the allopatric portions of the breeding ranges. I believe these taxa should continue to be considered distinct species. Received 10 May 1989, accepted 9 September 1989.

MOURNING (*Oporornis philadelphia*) and MacGillivray's (*O. tolmiei*) warblers form an east-west species complex, whose breeding ranges meet in the northern Great Plains (*sensu* Rising 1983). The Mourning Warbler is the eastern taxon; it breeds in boreal forest from Newfoundland to northeastern British Columbia and south to West Virginia, parts of Michigan, Wisconsin, Minnesota, and North Dakota. MacGillivray's Warbler breeds in riparian habitat and disturbed second growth in the Rocky Mountains from northern Arizona to Alaska. Both taxa were described as separate species by Baird (1858) and are still considered separate (AOU 1983). Difficulty in identifying intermediate specimens, however, has caused some ornithologists (Chapman 1917, Phillips 1947, Hofslund 1962, Mengel 1964, Mayr and Short 1970) to speculate that these taxa are eastern and western subspecies. Accounts of hybrid contact (Cox 1973, Salt 1973) have cast doubt on their specific status.

The doubts are based on the equivocal nature of plumage characters originally used to diagnose these taxa (Table 1). Characters used in diagnoses are presumed to be unique to a given taxon and provide 100% discrimination of spec-

imens. Further examination of Mourning Warbler specimens from different parts of its breeding range revealed the presence of intermediate specimens that possessed either dark lores, eye-arcs, absence of black bibs, or some combination of these (Chapman 1917, Hall 1979). Lanyon and Bull (1967) acknowledged the equivocal nature of plumage characters and used an external measurement (Wing minus Tail: $W - T$) to separate 98% of Mourning and MacGillivray's warbler specimens. Their results, however, were based exclusively on samples from the allopatric portions of the breeding ranges. Kowalski (1983) found much more overlap in $W - T$, using specimens near the potential contact zones. This result suggests hybrid contact between the taxa.

Cox (1973) collected some Mourning Warblers with "MacGillivray's-like" characters in central Alberta and concluded that the taxa hybridized there. Taverner (1919) collected a suspected mixed pair (Mourning male and MacGillivray's female) in Nevis, Alberta; but, based on the $W - T$ measurement, this female falls into the range of the Mourning Warbler (Hall 1979). Hall (1979) was also not convinced

TABLE 1. Plumage characters used to diagnose adult Mourning and MacGillivray's warblers.

Character	Mourning Warbler	MacGillivray's Warbler
Lores*	Absent	Dark in males
Eye-arc*	Absent in adults, present in immatures	Present in adults and immatures
Black bib*	Concentration of black feathers on lower throat and upper breast, present in males only	Diffuse black feathering on throat and upper breast of males, absent in females
Wing-minus-tail ^b measure	≥ 10 mm	≤ 11 mm

* Baird 1858, Coues 1903, Hall 1979.

^b Phillips 1947, Lanyon and Bull 1967.

that all intermediate specimens reported by Cox and others (Patti and Meyers 1976, Beimbom 1977) were hybrids because he found intermediate specimens of Mourning Warblers from the allopatric portions of its breeding range. These extreme variants from eastern Canada raise the question whether the intermediate nature of these specimens is due to hybridization or falls within the normal range of variability of either taxon.

My goal was to clarify the specific limits of these warbler taxa based on the distinctness of each taxon. I concentrated my analysis on males for two reasons: intermediate males show "hybrid characters" better than females and their singing behavior can be recorded and compared. I collected and compared fresh specimens from the allopatric portions of the breeding ranges and from the hypothetical contact areas, and I evaluated the range of variability and overlap in traditional plumage characters used to diagnose these taxa. I added two new suites of skeletal and behavioral characters to the analysis, and determined if specimens of these taxa occupy different "morphological or song space" based on principal components analyses (PCA) of morphological and song characters. Finally, I evaluated song syllable sharing by these taxa.

MATERIALS AND METHODS

Field methods.—Adult males were collected during the breeding season, between 6 June and 15 July from 1983 to 1986 (Fig. 1). In 1985 I concentrated my efforts in the potential contact areas in western Canada. Specimens were prepared in the field as flat skins and skeletons. All materials are at the American Museum of Natural History.

Whenever possible, I made tape recordings of *Oporornis* songs before collection. Not all specimens were recorded, however, nor were all recorded birds col-

lected. Recordings were made with a Uher-4000 Report Stereo and Dan Gibson E. P. M. 300 microphone. At least 10 songs per male were recorded before collection. At most localities, ≥ 30 songs were recorded from at least one male.

Morphology.—Because of the close morphological resemblance of these taxa and the paucity of plumage characters useful for diagnosis, hybrid indices were not considered appropriate. I scored all study skins for the presence or absence of eye-arcs and dark lores. Flattened wing measurements were made with a wing ruler (nearest 0.1 mm) and tail measurements were made with Max-cal Calipers (nearest 0.1 mm) according to Lanyon and Bull (1967). I also counted the number of males with $W - T$ measurements that fell within the intervals of $(W - T) < 8$ mm, 8 mm $< (W - T) < 9$ mm, 9 mm $< (W - T) < 10$ mm, 10 mm $< (W - T) < 11$ mm, 11 mm $< (W - T) < 12$ mm, 12 mm $< (W - T) < 13$ mm, $(W - T) > 13$ mm. I used histograms to display the frequency of Mourning vs. MacGillivray's warbler specimens with these characters. The song type of each specimen was also noted.

Analyses of skeletal characters provide an independent test of results obtained from plumage analyses (Troy 1985). Morphometric analyses of skeletal characters have been used successfully to discriminate sibling taxa of meadowlarks (*Sturnella*; Rowher 1972) and wood-pewees (*Contopus*; Rising and Schueler 1980). I used 25 skeletal dimensions from Robbins and Schnell (1971): premaxilla length (PRL), bill depth (BDEP), nasal bone width (NASW), interorbital width (INORW), skull width (SKW), skull length (SKL), mandible length (MANL), mandible depth (MAND), coracoid length (CORL), scapula width (SCAPW), sternum length (STERL), keel length (KEEL), keel depth (KEED), minimum synsacrum width (SYNMW), maximum synsacrum width (SYNW), femur distal end width (FEDW), femur length (FEL), tibiotarsus length (TIBL), tarsometatarsus length (TARL), tarsometatarsus depth (TARD), humerus trochanter length (HTRL), humerus distal end width (HDEW), humerus length (HURL), ulna length (ULNL), carpometacarpus length (CARPL). Skeletal dimensions were measured with Max-cal Calipers to the nearest 0.1 mm and entered

directly into a NEC Portable Computer (PC8201A) using Lessoft (version 1.0, Marcus 1982).

Song.—Song recordings, were analyzed on a Kay Elemetrics 6061 Sona-Graph using wide band filter. Terminology of components and physical parameters follows Shiovit (1975) and Baptista (1977). A *song note* is any continuous sound tracing on a sonograph. A *syllable* is a collection of notes, and a *song* is a collection of syllables. The different parts of primary song (I, II, III) in these taxa contained a unique single syllable type repeated several times. Songs were either *monosyllabic* (part I only), *disyllabic* (parts I and II), or *trissyllabic* (parts I, II, III).

Species differences in primary song most often occur in syllable/note morphology and/or frequency parameters (Becker 1982). I visually inspected syllables from each song and cataloged them based on differences in gross morphology (syllable catalogs in Pitocchelli 1988). I then compared syllables from both catalogs to determine the amount of syllable sharing between these taxa.

I analyzed differences between these taxa in the number of parts per song based on different syllable types (NPSO), number of syllables per song (NSSO), duration of song (DUR), minimum song frequency (MINS), maximum song frequency (MAXS), number of notes of the first syllable from part I of the song (NNA), number of notes of the first syllable from part II of the song (NFA), maximum frequency of the first syllable from part II of the song (MAFA), and maximum frequency of the second syllable from part II of the song (MAFB). Sonographs were measured with Max-cal Calipers to the nearest 0.1 mm and entered into a NEC Portable Computer-PC8201A (Marcus 1982). These measurements were later converted into kilohertz and seconds. I paid special attention to the songs of intermediate specimens (based on plumage or skeletal materials) of both taxa.

Statistics.—Multivariate analyses reorganize the total variation among correlated variables to a new set of uncorrelated variables. Several multivariate approaches have been applied in phenetic analyses involving the discrimination of operational taxonomic units (OTUs) (Sokal and Sneath 1963, Thorpe 1976). I used principal components analysis (PCA) to investigate the distinctness of these taxa in multivariate space based on external study skin measurements, skeletal measurements, and physical parameters of song. The following variables were used in these analyses: external measurements—Wing, Tail, Wing minus Tail ($W - T$); skeletal measurements—NASW, MANL, CORL, KEEL, FEL, ULNL, HUML; and song parameters—NPSO, NSSO, DUR, MINS, MAXS, NNA, NFA, MAFA, MAFB. Analyses of these data sets were conducted using PROC PRINCOMP in SAS (version 5.16, 1985). Raw data were \log_{10} -transformed prior to each multivariate analysis. I extracted PC scores for each specimen along the first three principal component axes from a variance-covariance matrix. I plot-

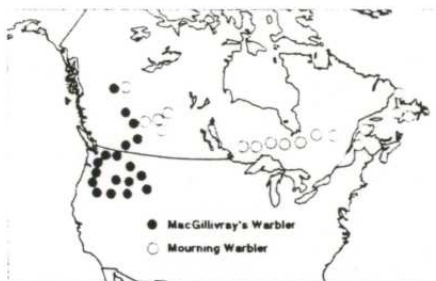


Fig. 1. Sampling localities of Mourning and MacGillivray's warblers (precise localities are available from the author).

ted the principal component (PRIN) scores in three dimensional space along the PRIN1, PRIN2, and PRIN3 axes. I rotated the plots along the x , y , and z axes using MACSPIN (version 2.0, 1988) until maximum separation of Mourning and MacGillivray's OTUs was achieved.

RESULTS

Studies of hybridization in birds have included samples from pure populations for comparisons with specimens from the contact zones (Rising 1983). I made collections and tape recordings of Mourning and MacGillivray's warblers from pure, well-marked populations in the allopatric regions of their breeding ranges and from the potential contact areas in Alberta and British Columbia. Mourning Warblers from Ontario, New York, and Quebec represented the allopatric portion of their breeding range. Allopatric samples of MacGillivray's Warblers came from south-central British Columbia, Washington, Oregon, California, Idaho, Nevada, Montana, and Wyoming. I collected 534 males of both taxa for plumage and skeletal analyses. The allopatric samples contained 218 Mourning and 236 MacGillivray's warblers. In 1985, I sampled contact areas previously reported by Erskine and Davidson (1976) in northeastern British Columbia, and by Cox (1973) and Salt (1973) in central Alberta. I collected and recorded birds along the Alaska Highway from the Liard River Hot Springs to Fort Nelson in northern British Columbia. In Alberta, I sampled from Lesser Slave Lake through Whitecourt, Obed, Brazeau Reservoir, Battle Lake, Red Deer to the Sheep River. This transect also included the sites studied by Cox

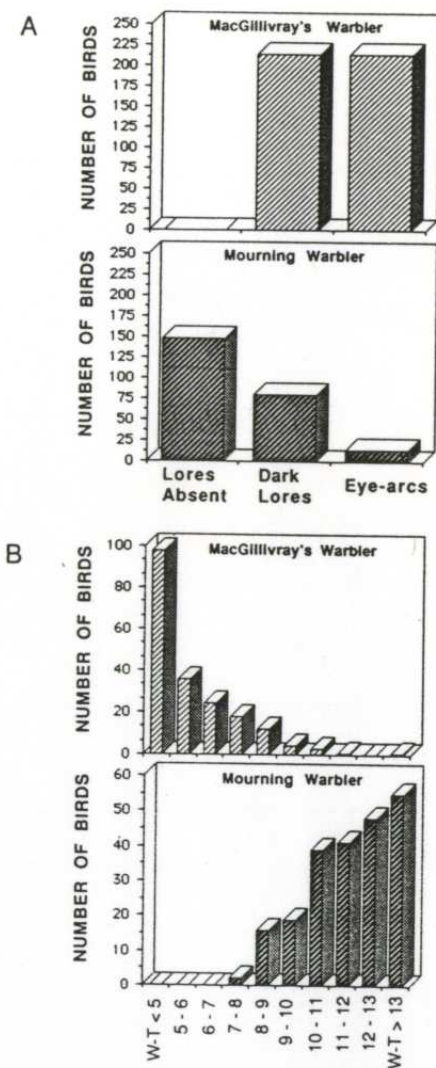


Fig. 2. Histograms of MacGillivray's and Mourning warbler specimens with traditional characters used to diagnose these taxa. (A) Frequency distributions of eye-arcs and dark lores. (B) Frequency distributions of specimens with wing-minus-tail ($W - T$) measurements (mm) falling in specified intervals.

(Rocky Mountain House, Caroline, Kananaskis) and Salt (Pigeon Lake) in 1973. I collected 49 Mourning Warblers and 29 MacGillivray's Warblers from these potential contact areas.

I taped singing males from the same localities. I recorded 137 Mourning Warblers from eastern Canada and 58 males from the contact areas. MacGillivray's males (116) were recorded in the northwestern United States and southern British Columbia. I recorded 19 males near the potential contact areas.

MORPHOLOGICAL CHARACTERS

External characters.—There was some overlap in plumage characters (Fig. 2). MacGillivray's Warblers were not variable for dark lores or eye-arcs. Extreme MacGillivray's Warblers resembled Mourning Warblers only in the wing-minus-tail ($W - T$) measurement. Extreme MacGillivray's Warblers were found in the allopatric parts of the breeding range and potential contact areas in Alberta and British Columbia. Four of these birds were from the allopatric regions (southern British Columbia, Washington, and Oregon) whereas two came from near the contact areas. All these extreme specimens sang only MacGillivray's song. Plumage characters of Mourning Warblers were more variable (Fig. 2). These birds either had dark lores, eye-arcs, ($W - T$) < 11 mm, lacked a black bib, or some combination of these characters. Although most Mourning Warblers lack dark lores, males with lores were found in small numbers throughout the breeding range. Extreme birds with eye-arcs were also uncommon (Fig. 2). There was no segregation or increase in intermediate specimens near the contact areas. For instance, there were higher incidences of males with eye-arcs in some Ontario localities (Dorion: 11.1% males with eye-arcs; Geraldton: 14.2%; and Cochrane: 16.6%) than in the potential contact areas in central Alberta (5.2%). All extreme Mourning Warbler specimens sang Mourning Warbler songs (Fig. 3: A, C). Although these external characters will work for most specimens, they are equivocal for extreme specimens.

MacGillivray's Warblers averaged longer tails than Mourning Warblers, which accounts for the smaller $W - T$ measurements (Table 2). Principal components analyses of external measurements (W , T , $W - T$) revealed little overlap in multivariate space (Fig. 4: A). Wing-minus-tail measurement had the highest loading on PRIN1 and contributed most to the separation along the PRIN1 axis (Table 3). PRIN1 accounted for 99% of the variance. In most morpho-

95-25

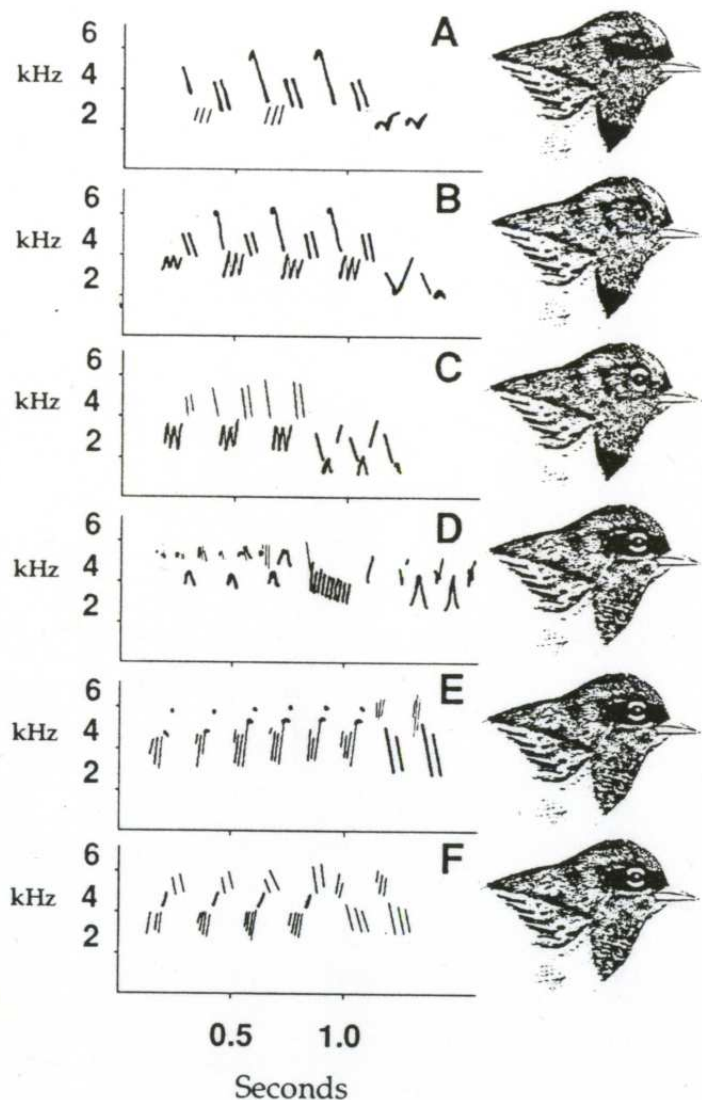


Fig. 3. Sonograms of Mourning and MacGillivray's warbler songs. (A) Ontario Mourning Warbler (AMNH 13365) with dark lores; (B) Maine Mourning Warbler male (AMNH 13263) lacking eye-arcs or dark lores; (C) Quebec Mourning Warbler male (AMNH 13333) with eye-arcs; (D) MacGillivray's Warbler male (AMNH 14358); (E) MacGillivray's male (AMNH 14362); (F) MacGillivray's male (AMNH 14363). The three MacGillivray's males (D-F) were neighbors from Jarbidge, Nevada. AMNH refers to American Museum of Natural History skeletal specimen catalog numbers. Warbler sketches by Ken Davignon and Jay Pitocchelli.

TABLE 2. Elementary statistics of *Oporornis* skeletal and external characters.

Character*	Mourning Warbler		MacGillivray's Warbler	
	n	Mean (SD)	n	Mean (SD)
PRL	230	13.72 (0.62)	176	13.43 (0.54)
BDEP	245	1.12 (0.11)	180	1.06 (0.12)
NASW	249	5.95 (0.33)	170	5.62 (0.28)
INORW	240	3.03 (0.24)	165	2.66 (0.18)
SKW	221	13.35 (0.31)	121	13.38 (0.25)
SKL	194	30.74 (0.73)	122	30.42 (0.60)
MANL	235	22.32 (0.62)	167	21.89 (0.54)
MAND	252	1.51 (0.08)	187	1.39 (0.08)
CORL	238	14.59 (0.36)	184	13.81 (0.37)
SCAPW	251	1.94 (0.18)	191	1.78 (0.14)
STERL	222	16.44 (0.52)	165	15.37 (0.54)
KEEL	222	14.71 (0.60)	171	13.58 (0.66)
KEED	225	6.32 (0.34)	172	5.84 (0.34)
SYNMW	220	8.90 (0.27)	152	8.79 (0.29)
SYNW	235	5.04 (0.26)	168	4.99 (0.24)
FEDW	242	2.61 (0.08)	188	2.53 (0.08)
FEL	232	15.48 (0.44)	171	14.76 (0.39)
TIBL	156	28.14 (0.71)	44	27.51 (0.65)
TARL	189	20.57 (0.62)	146	20.60 (0.60)
TARD	229	2.21 (0.23)	174	2.07 (0.17)
HTRL	249	3.64 (0.15)	164	3.48 (0.10)
HDEW	244	3.30 (0.14)	151	3.24 (0.11)
HUML	236	14.50 (0.30)	136	13.93 (0.37)
ULNL	187	16.53 (0.50)	129	16.03 (0.41)
CARPL	159	9.46 (0.36)	135	9.20 (0.29)
WEIGHT	239	12.27 (0.67)	139	11.17 (0.73)
WING	270	61.56 (1.95)	211	60.15 (2.10)
TAIL	263	49.32 (2.01)	202	54.78 (2.99)
W - T	261	12.21 (2.00)	202	5.37 (2.72)

* All measurements except WEIGHT (g) are in mm.

TABLE 3. Eigenvectors of principal component analyses (PCA) of external, skeletal, and song characters.*

Character	PRIN1	PRIN2	PRIN3
External character			
WING	0.019	0.626	0.779
TAIL	-0.103	0.776	-0.621
W - T	0.994	0.068	-0.080
% of total variance	99.2	0.6	0.07
Skeletal character			
NASW	0.507	-0.830	0.078
MANL	0.174	-0.116	-0.036
CORL	0.360	-0.135	0.214
KEEL	0.593	0.334	-0.713
FEL	0.313	0.274	0.411
ULNL	0.239	0.235	0.422
HUML	0.273	0.190	0.299
% of total variance	58.5	18.4	8.4
Song character			
NPSO	0.079	-0.035	0.076
NSSO	0.170	-0.097	0.318
DUR	0.145	-0.017	0.229
MINS	0.210	-0.155	0.318
MAXS	0.122	0.072	0.166
NNA	0.057	0.956	0.248
NFA	0.788	0.104	-0.595
MAFA	0.348	-0.091	0.324
MAFB	0.371	-0.161	0.435
% of total variance	44.0	31.0	11.7

* Three separate PCAs (external, skeletal, and song analyses) were performed on specimen and song data.

metric studies with PCA, PRIN1 has been interpreted as a "size" axis when all the character loadings on PRIN1 are positive (Zink 1988). Because Tail had a negative loading on PRIN1, it is unclear whether PRIN1 is a size axis in this analysis. Inclusion of W - T in the PCA is probably responsible for this negative loading. Tail and Wing contributed most to the separation of these taxa on the PRIN2 and PRIN3 axes. PRIN2 and PRIN3, however, accounted for only 0.67% of the variance (Table 3).

Skeletal characters.—Overall, the average Mourning Warbler is larger than the MacGillivray's Warbler for all skeletal characters except skull width and tarsometatarsus length (Table 2). Results of the PCA of skeletal characters show that these taxa are essentially distinct in multivariate space (Fig. 4: B). All seven skeletal characters had positive loadings on PRIN1 which indicates that PRIN1 is a "size" axis (Table 3). PRIN1 accounted for 58.5% of the

variance. KEEL length and NASW had the highest loadings on PRIN1. They provided the best separation of specimens along this axis. NASW contributed the most to separation of specimens along PRIN2. PRIN2 accounted for 18.4% of the variance. KEEL had the highest loadings on PRIN3 which accounted for 8.4% of the total variance.

SONG CHARACTERS

Although males of both taxa sang univalent song repertoires, differences exist in the syllable repertoire and the pattern of geographic variation in these syllables. There were five MacGillivray's syllables which remotely resembled Mourning syllables. They were not exact duplicates, differing in syllable morphology, frequency, and duration parameters. Geographic variation in Mourning Warbler song is conservative compared with that of MacGillivray's Warbler. The breeding range of the Mourning Warbler is dominated by three regional dialects.

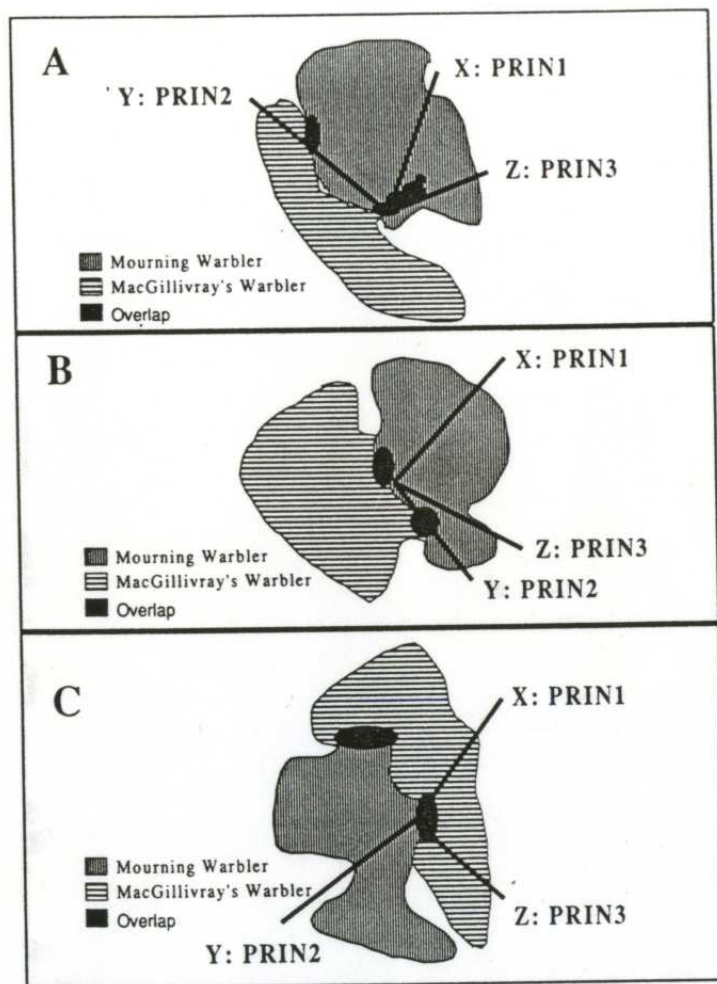


Fig. 4. Plot of specimens and songsters on principal component axes I, II, III, showing minimal overlap between taxa. Shaded areas represent clouds of points occupied by individuals in multivariate space. (A) Plots based on analysis of Wing, Tail, and $W - T$ measurements; (B) plots based on analysis of seven skeletal characters; (C) plots based on analysis of nine song parameters.

In these dialect systems all birds sing the same song type, differing primarily in the number of syllables and/or physical parameters. In contrast, almost every male MacGillivray's Warbler sang a different song type (Fig. 3: D, E, F). The total number of syllables encountered versus the number of birds sampled was higher for MacGillivray's Warblers compared with Mourning Warblers (Fig. 5).

Mourning Warblers sang lower frequency songs on average compared with MacGillivray's males (Table 4). Mourning Warblers also sang less complex songs. MacGillivray's males sang two- or three-part songs, which contained two or more syllable types. In contrast, most western Mourning Warblers sang one-part monosyllabic songs, whereas most eastern males sang two-part songs. MacGillivray's songs averaged more

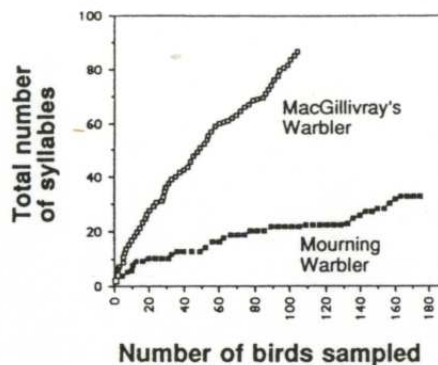


Fig. 5. Number of new syllables encountered with each new songster sampled for Mourning and MacGillivray's warblers.

NFA and NSSO (Table 4). Principal components analysis of song parameters revealed good separation of these taxa in multivariate space (Fig. 4: C). Loadings of parameter variables on PRIN1 were all positive (Table 3). The NPSO and NFA provided most of the separation of songsters along PRIN1. PRIN1 accounted for 44.0% of the variance. NNA contributed to the separation of songsters along PRIN2, which accounted for 31.0% of the variance. PRIN3 accounted for only 11.7% of the variation. Contributions from NFA and MAFB were largely responsible for separation along this axis.

HYBRID CONTACT

Contact between these taxa is different from other east-west species pairs (e.g. flickers, towhees, orioles, buntings), which hybridize in broad zones across the Great Plains (for review, see Rising 1983). Mourning and MacGillivray's warblers meet irregularly in British Columbia and Alberta. In Alberta, Mourning Warblers breed north of Kananaskis in disturbed second growth throughout the province (Salt 1973). MacGillivray's Warblers are limited to the Cypress Hills in southeastern Alberta and the Rocky Mountain region from Kananaskis south in southwestern Alberta and along the Red Deer River. In British Columbia, MacGillivray's Warblers are much more common than Mourning Warblers. They are found throughout British Columbia, whereas the Mourning Warbler is restricted to the northeastern corner of British

Columbia at the edge of the boreal forest (Erskine and Davidson 1976).

Cox (1973) and Salt (1973) observed contact in central Alberta. Cox (1973) described "contact points" in central Alberta that involved one or two individuals from one taxon mixing with many individuals from the other taxon. On the Bow River near Kananaskis, he collected a single Mourning female mixed in with MacGillivray's Warblers. I collected seven MacGillivray's Warblers in Kananaskis, but I did not collect or observe any Mourning Warblers. Cox also mist-netted four intermediate (but see Hall 1979) specimens 9 km west of Rocky Mountain House and 27 km west of Caroline near Red Deer. I did not find intermediates or members of either taxon at the Caroline or Rocky Mountain House locations. I also found neither the pure Mourning Warbler populations near Red Deer nor the pure MacGillivray's Warbler populations at Trochu reported by Cox (1973).

Salt (1973) found a single MacGillivray's male singing among several Mourning Warblers at Pigeon Lake, south of Edmonton, but I found only Mourning Warblers at Pigeon and Battle lakes. I collected both taxa west of Edmonton along the Athabasca River. I tape-recorded one MacGillivray's male and collected another near Hinton. The closest Mourning Warblers were 50 km east of Hinton, north of Obed. This was the closest these taxa came to one another during the summer of 1985. The Mourning Warbler does not occur in the foothills of the Rocky Mountains, and MacGillivray's Warblers rarely enter into the foothills from the mountains. The dry lodgepole pine forest of the foothills does not provide the dense undergrowth for breeding required by these taxa. The rare spillover of MacGillivray's Warblers into the foothills and beyond, in combination with the destruction of boreal forest for farming and ranching in central Alberta, limits contact between these taxa.

Erskine and Davidson (1976) and British Columbia Hydro (1981, M5) reported similar contact between these taxa in north-central British Columbia at Liard River Hot Springs. I sampled along the Alaska Highway from Liard River east to Fort Nelson. I collected individuals with MacGillivray's plumage and song types at Liard River. The closest Mourning Warblers were ca. 200 km east of Liard River at Steamboat, Klede Creek, and Fort Nelson. Erskine (pers. comm.) pointed out that previous accounts of Mourning Warblers at Liard River probably refer to mi-

TABLE 4. Elementary statistics of physical parameters of *Oporornis* song.

Character	Mourning Warbler		MacGillivray's Warbler	
	n	Mean (SD)	n	Mean (SD)
NPSO	188	1.72 (0.45)	116	2.04 (0.62)
NSSO	186	5.68 (1.05)	115	6.99 (1.56)
DUR*	182	1.11 (0.17)	112	1.29 (0.22)
MINS*	187	1,933.24 (301.04)	111	2,416.05 (334.50)
MAXS*	180	5,458.81 (699.44)	107	5,953.18 (648.48)
NNA	174	4.58 (1.36)	100	4.38 (1.42)
NFA	133	2.54 (0.83)	95	4.34 (1.80)
MAFA*	132	3,975.13 (558.52)	95	5,437.49 (801.62)
MAFB*	122	3,744.93 (615.41)	85	5,388.10 (788.62)

* Duration variables in seconds.

* Frequency variables in Hz.

grants or vagrants but not to breeders. For 200 km between Fort Nelson and Liard River Hot Springs, there is a dry lodgepole pine forest that lacks suitable breeding habitat for either taxon. This acts as a barrier to contact between these taxa.

Further contact between these taxa seems unlikely. In British Columbia, the breeding ranges do not come close together. Agricultural practices in Alberta have been largely responsible for widening the gap between Mourning and MacGillivray's warblers. Beneath the foothills of the Rocky Mountains, farming and ranching are destroying suitable breeding habitat for Mourning Warblers and thus pushing the breeding range of the Mourning Warbler eastward and northward away from any potential contact.

DISCUSSION

Species limits.—These taxa overlap in plumage characters, but the incidence of overlap is low. Very few MacGillivray's Warblers resemble Mourning Warblers, and then only for the wing-minus-tail ($W - T$) character. Although many more Mourning Warblers possess eye-arcs, dark lores, or ($W - T$) < 11 mm, none of the intermediate Mourning specimens I studied possessed all three MacGillivray's characters. In contrast to plumage, PCA of the external and skeletal measurements show separation of these taxa (Fig. 4: A, B). Because these taxa do not hybridize in large zones, the intermediacy of problem specimens cannot be due to hybridization events. Intermediate individuals simply fall within the normal range of variability for each taxon.

Bush (1975) emphasized the importance of bird song as an example of a prezygotic isolat-

ing mechanism. Vocal characters have proved to be useful tools for evolutionary biologists (Lanyon 1969). Studies of *Empidonax* (Stein 1963, Johnson 1980) and *Myiarchus* flycatchers (Lanyon 1978) have shown the value of song characters in delimiting sibling taxa. Major differences in primary song also occur between Mourning and MacGillivray's warblers. Although there is geographic variation in song in both taxa, there is no syllable sharing between these taxa, and the pattern of geographic variation in these syllables is different in each taxon. Almost every MacGillivray's male sang a unique song. In contrast, the breeding range of the Mourning Warbler was dominated by three major dialect systems (Pitocchelli 1988). Furthermore, there is evidence of song displacement in these taxa. The western dialect system of Mourning Warbler males is dominated by one-part monosyllabic songs, whereas MacGillivray's male sing two- and three-part songs. Two-part songs dominate the eastern dialect systems of the Mourning Warbler. Based on principal component analyses of physical parameters of song, operational taxonomic units (OTUs) of each taxon occupy a unique portion of "song space." Mourning males with two-part songs use different syllables and occupy separate song space from MacGillivray's males with two-part songs (Fig. 4: C). Song differences are strong and consistent throughout the ranges of these taxa. Song types of eastern and western Mourning Warbler specimens that were intermediate for plumage characters were similar to "normal" plumage neighbors. Mourning Warbler males with eye-arcs or dark lores sang the same songs as Mourning Warblers that lacked these characters (Fig. 3: A, B, C). MacGillivray's Warblers which resembled Mourning Warblers

for the $W - T$ measurement did not have songs with Mourning Warbler syllables. This problem is similar in other sibling species where behavioral differentiation may have proceeded faster than morphological characters. Although these communications systems appear unique to each taxon, the role of learning versus the influence of behavior on song has not been investigated.

The central question of my study was whether to ascribe specific status to these taxa or combine them into a single taxon as two subspecies. Traditionally, interbreeding has been the most important criterion for making this judgment (Mayr 1969), but some authors stress genotypic and phenotypic distinctness over the ability to interbreed (Cracraft 1983, McKittrick and Zink 1988). In my opinion, Mourning and MacGillivray's warblers should continue to be considered separate species, based on the distinctness of their primary song and skeletal differences. Although their plumages are similar, operational taxonomic units of these taxa occupy different portions of morphological and song space. The different patterns of geographic variation in primary song—conservative in Mourning Warblers versus highly variable in MacGillivray's Warblers—also point to separate evolutionary histories. These taxa are also still essentially allopatric, and hard evidence of assortative mating is unattainable. Results of preliminary playback experiments simulating sympathy between these taxa revealed that males of both taxa can discriminate conspecific from experimental song types (Salt 1973, Pitocchelli 1988). Only 1 of the 25 Mourning and MacGillivray's warblers was unable to discriminate between song types. This supports the importance of the distinctness of primary song in these taxa and also points to positive assortative mating if and when these taxa come back together.

Identification of extreme specimens.—Identification of extreme specimens continues to be a problem for this complex. Except for song type, no single character distinguishes these taxa 100% of the time, and song is useless for females and migrants. Although $W - T$ appears to be the best morphological character, my results and Kowalski's (1983) have shown that it is equivocal for separating some extreme specimens. Most problem specimens have been Mourning Warblers that resemble MacGillivray's Warblers for one but usually not all plumage characters. Combinations of these characters are useful for identifying extreme specimens. Full eye-arcs contain thick layers of white feathers above and

below the eye. Eye-arcs in Mourning Warblers are usually weak, but some extreme specimens may resemble full eye-arcs of MacGillivray's Warblers. If, in spring, males east of the Rocky Mountains do not possess eye-arcs and dark lores, then they are Mourning Warblers. If they possess both, then refer to the song type (if possible) and the $W - T$ measurement. Although I collected females, the sample sizes were much lower than in Lanyon and Bull (1967). Therefore, for identification of females, refer to the quality of the eye-arc (thick versus weak) and Lanyon and Bull's $W - T$ measurement for separation.

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