# A CATALOGUE OF RADIO SOURCES BETWEEN DECLINATIONS —50° AND —80°

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*Summary*

A catalogue has been prepared of the radio sources observed between declinations —50° and —80°, using the Sydney cross-type radio telescope at a wavelength of 3·5 m; a total of 219 sources is listed. This supplements the earlier catalogues for the declination ranges +10° to —20° and —20° to —50°. In addition to the positions and intensities of the sources, angular sizes of 42 of the strongest sources are given. As before, identifications with bright optical objects have been sought, and a number of possible identifications with emission nebulae and bright galaxies are listed. Because of the small area of sky covered by the present catalogue, the numbers of sources are small (compared with those in our earlier catalogues) so that the statistical analysis of their distribution has comparatively low weight. However, the analysis gives results consistent with those obtained using the earlier catalogues. Finally, the present state of the identification of sources in our catalogues is briefly reviewed.

## I. Introduction

Catalogues of radio sources observed with the Sydney 3·5 m cross-type radio telescope covering declinations +10° to —50° have been published (Mills, Slee, and Hill 1958, 1960). The present catalogue concludes this series by extending the area to —80°. In a paper in preparation an attempt will be made to assess the general accuracy of our catalogues in performing their intended function, and a number of alterations which have been found necessary in previous catalogues will also be included.

The southernmost area is particularly difficult to catalogue because of spurious responses, which are here more obtrusive than usual. The geometry of the situation is such that strongly emitting regions are within the fan-beams of the cross, where side lobes tend to be higher, for a greatly increased proportion of the observing time. This effect has been discussed in an earlier paper (Mills, Little, Sheridan, and Slee 1958) which contains a diagram showing the regions most likely to be affected.

Because of the above difficulty, combined with the small total area of the region, fewer sources are listed in the present catalogue. The total is 219 which, in the area of 1·36 steradians, corresponds to 161 sources per steradian, or approximately half the source density of the earlier catalogues. The total number of sources listed in the whole area, +10° to —80°, is 2270. The additional sources in the present catalogue are too few to affect the source count statistics

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presented in our last paper (Mills, Slee, and Hill 1960), so that no further analysis is given here. It may be noted, however, that there are no significant divergences from earlier results.

## II. The Catalogue

Preparation of the catalogue follows the methods described in the earlier papers. The catalogue is divided into three zones covering declinations −50° to −60°, −60° to −70°, and −70° to −80°; these are given in Tables 1, 2, and 3 respectively. The usual scheme of reference numbers is adopted for identifying a radio source, that is, the first two digits of the reference number denote the hour of the Right Ascension; these are followed by the sign of the declination and the tens digit measured in degrees and, finally, an italicized serial number arranged in order of increasing Right Ascension within the 1-hr period. Only the latter italicized numbers are given in Tables 1, 2, and 3 as the others are evident; for example, in Table 1 the third source would be referred to as 00–5*3*. As before, the probable error in the final digit of a measured position is indicated by a superscript.

Radio sources resolved by the aerial beam have been treated as before, both their peak flux density and their integrated flux being given, the former in parentheses. Such sources have been called "extended" sources, while others which may have been resolved have been described as "perhaps extended", or words to that effect. However, our interpretation of the word "extended" given in the preliminary catalogue (Mills and Slee 1957) needs to be re-emphasized—it is that "these (extended or perhaps extended sources) may either be sources of large angular size, or blends of two or more small sources"—it is not possible from a pencil-beam survey alone to differentiate between these two possibilities if the blending sources are close enough to one another.

Angular sizes, when they are quoted in the footnotes, have been derived from the radio link interferometer (Goddard, Watkinson, and Mills 1960). These measurements are preliminary and are likely to be improved later.

Possible identifications with bright nebulae and galaxies are also given in the footnotes; they have been taken mainly from the catalogues of Becvar (1951). When the catalogue number of the nebula is in parentheses there is no reason for thinking that this is other than an accidental coincidence in position. The catalogues of Bok, Bester, and Wade (1955) and Gum (1955) have been used to supplement the information about emission nebulae in the Becvar catalogues.

## III. Identifications

Although the area included in the present catalogue is much less than in our previous catalogues, a reasonable number of identifications with bright nebulae may be suggested. This situation arises principally because the southern regions of the Milky Way, rich in H II regions but comparatively low in radio brightness, are included in the catalogue area. Several such H II regions may be recognized as radio sources; the data relating to them are collected in Table 4, and, in Table 5, the bright external galaxies for which possible identifications exist are also listed. There is also noted in the catalogue a globular cluster

TABLE 1

SOURCES BETWEEN DECLINATIONS —50° AND —60°

Sources which may be "extended", that is resolvable, are indicated by a dagger. A colon is placed beside uncertain flux densities. Angular sizes, where available, are indicated in the footnotes

| Ref. No. | Position (1950) R.A. (h m) | Position (1950) Dec. S. (° ′) | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) |
|---|---|---|---|
| | 00 | | |
| *1* | $02\cdot7^{4}$ | $56\ 28^{6}$ | 19† |
| *2* | $27\cdot2^{6}$ | $55\ 12^{6}$ | 12 |
| *3* | $36\cdot1^{3}$ | $51\ 36^{6}$ | 11 |
| *4* | $58\cdot1^{3}$ | $50\ 41^{6}$ | 10 |
| | 01 | | |
| *1* | $01\cdot0^{6}$ | $55\ 58^{8}$ | 8 |
| *2* | $15\cdot2^{5}$ | $52\ 05^{6}$ | 15 |
| *3* | $19\cdot9^{3}$ | $50\ 24^{6}$ | 12 |
| *4* | $26\cdot1^{5}$ | $53\ 02^{6}$ | 11 |
| *5* | $29\cdot6^{8}$ | $51\ 12^{8}$ | 8 |
| *6* | $41\cdot5^{8}$ | $54\ 56^{6}$ | 9: |
| *7* | $44\cdot9^{5}$ | $52\ 12^{7}$ | 13† |
| *8* | $47\cdot1^{5}$ | $57\ 53^{6}$ | 20 |
| | 02 | | |
| *1* | $16\cdot1^{4}$ | $57\ 42^{5}$ | 9 |
| *2* | $26\cdot0^{4}$ | $52\ 43^{7}$ | 11†[(1)] |
| *3* | $42\cdot3^{3}$ | $51\ 23^{5}$ | 37[(2)] |
| *4* | $45\cdot8^{2}$ | $55\ 52^{4}$ | 48[(3)] |
| *5* | $49\cdot7^{4}$ | $54\ 24^{6}$ | 15 |
| *6* | $56\cdot4^{5}$ | $52\ 37^{7}$ | 11 |
| | 03 | | |
| *1* | $36\cdot7^{5}$ | $57\ 35^{6}$ | 11 |
| *2* | $44\cdot3^{4}$ | $53\ 16^{7}$ | 18† |
| *3* | $46\cdot6^{4}$ | $52\ 20^{6}$ | 13 |
| | 04 | | |
| *1* | $00\cdot3^{4}$ | $50\ 30^{7}$ | 11 |
| *2* | $11\cdot1^{4}$ | $56\ 04^{6}$ | 16 |
| *3* | $22\cdot7^{5}$ | $52\ 57^{7}$ | 14† |
| *4* | $28\cdot0^{2}$ | $53\ 59^{3}$ | 50[(4)] |
| *5* | $43\cdot1^{8}$ | $51\ 22^{7}$ | 8 |
| | 05 | | |
| *1* | $36\cdot0^{4}$ | $51\ 30^{7}$ | 10 |
| *2* | $37\cdot9^{10}$ | $52\ 56^{8}$ | 9 |
| *3* | $53\cdot6^{4}$ | $54\ 08^{6}$ | 12 |
| | 06 | | |
| *1* | $05\cdot3^{3}$ | $50\ 32^{7}$ | 13 |
| *2* | $09\cdot6^{5}$ | $58\ 33^{6}$ | 12† |
| *3* | $20\cdot7^{3}$ | $52\ 35^{5}$ | 30 |
| *4* | $22\cdot3^{6}$ | $50\ 15^{7}$ | 8 |
| *5* | $25\cdot4^{1}$ | $53\ 44^{4}$ | *172* (113)[(5)] |
| *6* | $42\cdot2^{4}$ | $54\ 00^{6}$ | 9 |
| *7* | $50\cdot7^{4}$ | $56\ 55^{7}$ | 18 |
| | 07 | | |
| *1* | $00\cdot5^{4}$ | $59\ 21^{6}$ | 15 |
| *2* | $06\cdot2^{4}$ | $50\ 19^{6}$ | 10 |
| *3* | $18\cdot3^{3}$ | $55\ 33^{5}$ | 24 |
| *4* | $20\cdot0^{3}$ | $52\ 42^{6}$ | 13 |
| *5* | $29\cdot7^{3}$ | $52\ 43^{6}$ | 12 |
| *6* | $40\cdot6^{8}$ | $54\ 07^{10}$ | *18*: (11)[(6)] |
| *7* | $48\cdot2^{5}$ | $57\ 42^{6}$ | 10 |
| *8* | $53\cdot5^{6}$ | $56\ 14^{8}$ | 8 |

(1) A doubtful source.

(2) $<10''$.

(3) $\geqslant 40''$.

(4) I 2082$>40''$.

(5) Perhaps two sources, $20''$.

(6) Perhaps two sources.

TABLE 1 (*Continued*)

| Ref. No. | Position (1950) R.A. h m | Position (1950) Dec. S. ° ′ | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) |
|---|---|---|---|
| | 08 | | |
| *1* | $12\cdot7^{4}$ | $53\ 44^{8}$ | 15† |
| *2* | $27\cdot6^{6}$ | $51\ 07^{8}$ | 10 |
| *3* | $44\cdot7^{3}$ | $57\ 20^{7}$ | 30[7] |
| | 09 | | |
| *1* | $05\cdot7^{5}$ | $53\ 05^{5}$ | 8 |
| *2* | $16\cdot4^{3}$ | $54\ 38^{5}$ | 36†[8] |
| *3* | $26\cdot8^{5}$ | $50\ 15^{7}$ | 14 |
| *4* | $38\cdot1^{5}$ | $53\ 25^{7}$ | 23†[9] |
| *5* | $39\cdot6^{6}$ | $57\ 02^{6}$ | 9: |
| | 10 | | |
| *1* | $05\cdot6^{4}$ | $56\ 53^{7}$ | *68* (47) |
| *2* | $06\cdot2^{5}$ | $55\ 31^{7}$ | 26† |
| *3* | $17\cdot2^{6}$ | $58\ 50^{10}$ | 71:†[10] |
| *4* | $20\cdot3^{5}$ | $57\ 34^{6}$ | *151* (96)[11] |
| *5* | $38\cdot1^{4}$ | $53\ 41^{6}$ | 9: |
| *6* | $41\cdot3^{5}$ | $51\ 55^{7}$ | 9 |
| *7* | $43\cdot5^{2}$ | $59\ 30^{3}$ | *339* (242)[12] |
| *8* | $53\cdot0^{4}$ | $56\ 26^{7}$ | 19 |
| *9* | $54\cdot8^{5}$ | $58\ 10^{6}$ | 20 |
| *10* | $59\cdot6^{4}$ | $51\ 07^{7}$ | 13 |
| | 11 | | |
| *1* | $05\cdot7^{3}$ | $53\ 49^{6}$ | 12 |
| *2* | $07\cdot7^{6}$ | $57\ 09^{6}$ | 15 |
| *3* | $18\cdot9^{4}$ | $50\ 40^{6}$ | 14 |
| *4* | $22\cdot2^{4}$ | $59\ 10^{6}$ | 39 |
| *5* | $24\cdot1^{3}$ | $56\ 04^{5}$ | 30 |
| *6* | $49\cdot7^{3}$ | $54\ 05^{5}$ | 16[13] |

| Ref. No. | Position (1950) R.A. h m | Position (1950) Dec. S. ° ′ | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) |
|---|---|---|---|
| | 12 | | |
| *1* | $08\cdot1^{3}$ | $52\ 20^{5}$ | *182* (114)[14] |
| *2* | $28\cdot1^{4}$ | $59\ 59^{6}$ | 19 |
| *3* | $36\cdot0^{4}$ | $55\ 29^{8}$ | 16 |
| *4* | $43\cdot3^{4}$ | $53\ 25^{6}$ | 17 |
| *5* | $59\cdot1^{4}$ | $52\ 10^{6}$ | 22† |
| | 13 | | |
| *1* | $51\cdot7^{5}$ | $52\ 10^{6}$ | 18 |
| *2* | $59\cdot6^{8}$ | $57\ 56^{10}$ | *71* (35) |
| | 14 | | |
| *1* | $03\cdot6^{4}$ | $54\ 27^{5}$ | 12 |
| *2* | $05\cdot7^{4}$ | $51\ 20^{7}$ | 39 |
| *3* | $05\cdot7^{8}$ | $59\ 08^{10}$ | 44:† |
| *4* | $14\cdot7^{5}$ | $52\ 25^{6}$ | 18 |
| *5* | $19\cdot6^{3}$ | $55\ 53^{5}$ | 36[15] |
| *6* | $26\cdot2^{5}$ | $50\ 56^{5}$ | 15 |
| *7* | $37\cdot8^{4}$ | $59\ 44^{4}$ | *167* (133)[16] |
| *8* | $50\cdot0^{5}$ | $59\ 03^{5}$ | 71:†[17] |
| | 15 | | |
| *1* | $08\cdot7^{4}$ | $50\ 28^{6}$ | 27† |
| *2* | $11\cdot5^{5}$ | $58\ 55^{6}$ | *252* (190)[18] |
| *3* | $15\cdot6^{5}$ | $57\ 30^{6}$ | 55 |
| *4* | $28\cdot3^{6}$ | $56\ 08^{6}$ | 50:† |
| *5* | $44\cdot0^{3}$ | $54\ 30^{7}$ | 70†[19] |
| *6* | $48\cdot6^{3}$ | $55\ 56^{4}$ | *323* (270)[20] |
| *7* | $50\cdot8^{4}$ | $53\ 14^{5}$ | 146:[21] |
| *8* | $58\cdot0^{2}$ | $52\ 07^{4}$ | 91[22] |

(7) Perhaps extended or two sources, $>30''$.
(8) $>30''$.
(9) A doubtful source ; perhaps a galactic irregularity.
(10) $>30''$.
(11) (S 29).
(12) $\eta$ Carinae nebula NGC 3372.
(13) Perhaps a side lobe of 17S2A.
(14) Perhaps two sources, $>40''$.
(15) $>40''$.
(16) $>55''$.
(17) $>30''$.
(18) BWW228*02*, $<30''$.
(19) $>40''$.
(20) $>50''$.
(21) $>60''$.
(22) $>45''$.

TABLE 1 (*Continued*)

| Ref. No. | Position (1950) R.A. (h m) | Position (1950) Dec. S. (° ′) | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) |
|---|---|---|---|
| | 16 | | |
| *1* | $11\cdot5^{4}$ | $50\ 40^{5}$ | 256†[23] |
| *2* | $13\cdot9^{6}$ | $54\ 00^{8}$ | 33 |
| *3* | $26\cdot5^{6}$ | $52\ 10^{7}$ | 32 |
| | 17 | | |
| *1* | $55\cdot0^{4}$ | $59\ 45^{6}$ | 25: |
| | 18 | | |
| *1* | $05\cdot8^{6}$ | $50\ 56^{8}$ | 20:† |
| *2* | $14\cdot5^{6}$ | $51\ 59^{5}$ | 27[24] |
| *3* | $18\cdot8^{3}$ | $55\ 32^{7}$ | 23† |
| *4* | $41\cdot6^{3}$ | $55\ 05^{5}$ | 12 |
| | 19 | | |
| *1* | $15\cdot5^{6}$ | $53\ 02^{5}$ | 16 |
| *2* | $17\cdot7^{5}$ | $54\ 30^{5}$ | 27 |
| *3* | $22\cdot5^{4}$ | $57\ 47^{6}$ | 16 |
| *4* | $23\cdot6^{5}$ | $51\ 27^{7}$ | 17 |
| *5* | $25\cdot8^{6}$ | $52\ 25^{8}$ | 10 |
| *6* | $34\cdot5^{4}$ | $58\ 31^{5}$ | 17 |
| *7* | $54\cdot3^{3}$ | $55\ 16^{4}$ | 54[25] |
| | 20 | | |
| *1* | $03\cdot4^{6}$ | $53\ 59^{6}$ | 12: |
| *2* | $06\cdot8^{2}$ | $56\ 39^{4}$ | 81[26] |
| *3* | $10\cdot3^{4}$ | $52\ 21^{6}$ | 14 |
| *4* | $13\cdot4^{4}$ | $55\ 37^{6}$ | 19 |
| *5* | $20\cdot3^{4}$ | $57\ 33^{5}$ | 36[27] |
| *6* | $40\cdot8^{6}$ | $51\ 17^{8}$ | 9 |
| *7* | $46\cdot6^{8}$ | $57\ 23^{8}$ | 12:[28] |
| | 21 | | |
| *1* | $13\cdot7^{4}$ | $50\ 54^{5}$ | 13 |
| *2* | $22\cdot4^{6}$ | $55\ 32^{7}$ | 17 |
| *3* | $25\cdot5^{5}$ | $58\ 04^{6}$ | 17 |
| *4* | $30\cdot1^{5}$ | $53\ 44^{7}$ | 20 |
| *5* | $37\cdot6^{6}$ | $51\ 28^{8}$ | 10† |
| *6* | $41\cdot0^{6}$ | $56\ 52^{8}$ | 18: |
| *7* | $49\cdot8^{5}$ | $58\ 26^{7}$ | 13 |
| *8* | $50\cdot9^{3}$ | $51\ 53^{5}$ | 28[29] |
| | 22 | | |
| *1* | $18\cdot5^{4}$ | $50\ 32^{6}$ | 16 |
| *2* | $23\cdot7^{3}$ | $52\ 45^{5}$ | 30[30] |
| *3* | $45\cdot4^{6}$ | $51\ 17^{7}$ | 7 |
| *4* | $53\cdot2^{3}$ | $53\ 02^{5}$ | 22 |
| *5* | $54\cdot5^{4}$ | $52\ 15^{5}$ | 28[31] |
| | 23 | | |
| *1* | $25\cdot1^{6}$ | $52\ 18^{7}$ | 9 |
| *2* | $38\cdot9^{4}$ | $58\ 34^{5}$ | 25 |

[23] $>60''$.
[24] (NGC 6584), $<15''$.
[25] $>40''$.
[26] $\geqslant 35''$.
[27] $<15''$.
[28] I 5063.
[29] $30''$.
[30] $\sim 15''$.
[31] $\leqslant 15''$.

Table 2

SOURCES BETWEEN DECLINATIONS −60° AND −70°

Sources which may be "extended", that is resolvable, are indicated by a dagger. A colon is placed beside uncertain flux densities. Angular sizes, where available, are indicated in the footnotes

| Ref. No. | Position (1950) R.A. h m | Position (1950) Dec. S. ° ′ | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) |
|---|---|---|---|
| | 00 | | |
| *1* | $13\cdot4^{4}$ | $63\ 20^{5}$ | 27 |
| | 01 | | |
| *1* | $20\cdot2^{4}$ | $63\ 14^{5}$ | 22 |
| *2* | $28\cdot7^{5}$ | $61\ 37^{6}$ | 17 |
| *3* | $38\cdot9^{5}$ | $69\ 58^{6}$ | 22 |
| *4* | $59\cdot5^{6}$ | $60\ 55^{6}$ | 14 |
| | 02 | | |
| *1* | $00\cdot9^{8}$ | $60\ 38^{7}$ | 10: |
| *2* | $08\cdot3^{5}$ | $62\ 11^{7}$ | 11 |
| *3* | $31\cdot1^{6}$ | $66\ 25^{7}$ | 13 |
| *4* | $48\cdot0^{3}$ | $60\ 17^{5}$ | 19 |
| *5* | $51\cdot7^{5}$ | $67\ 42^{5}$ | 34†(1) |
| | 03 | | |
| *1* | $46\cdot0^{6}$ | $68\ 00^{7}$ | 10: |
| | 04 | | |
| *1* | $02\cdot5^{4}$ | $63\ 44^{9}$ | 14 |
| *2* | $07\cdot1^{3}$ | $65\ 58^{5}$ | 36(2) |
| *3* | $19\cdot9^{2}$ | $62\ 29^{5}$ | 38(3) |
| *4* | $29\cdot3^{3}$ | $61\ 31^{5}$ | 35† |
| *5* | $37\cdot0^{4}$ | $64\ 47^{6}$ | 16 |
| *6* | $49\cdot0^{6}$ | $62\ 08^{6}$ | 9 |
| | 05 | | |
| *1* | $05\cdot5^{3}$ | $61\ 07^{6}$ | 14 |
| *2* | $08\cdot2^{5}$ | $62\ 21^{8}$ | 11 |
| *3* | 17: | 69 18: | 4000 (100)(4) |
| *4* | $25\cdot4^{4}$ | $65\ 58^{5}$ | 34(5) |
| *5* | $31\cdot0^{5}$ | $63\ 41^{10}$ | 10 |
| *6* | $39\cdot8^{4}$ | $69\ 20^{5}$ | 108†(6) |
| | 06 | | |
| *1* | $07\cdot8^{5}$ | $65\ 58^{7}$ | 14: |
| *2* | $09\cdot2^{6}$ | $60\ 40^{6}$ | 16 |
| *3* | $50\cdot8^{5}$ | $60\ 28^{8}$ | 9:: |
| *4* | $57\cdot6^{4}$ | $65\ 38^{6}$ | 17 |
| *5* | $59\cdot5^{5}$ | $67\ 15^{7}$ | 14 |
| | 07 | | |
| *1* | $11\cdot6^{3}$ | $64\ 27^{7}$ | 16 |
| *2* | $22\cdot5^{8}$ | $65\ 14^{7}$ | 8 |
| | 09 | | |
| *1* | $04\cdot1^{8}$ | $65\ 40^{6}$ | 8:: |
| *2* | $08\cdot4^{6}$ | $63\ 24^{6}$ | 15(7) |
| *3* | $37\cdot0^{5}$ | $62\ 35^{6}$ | 16 |
| *4* | $57\cdot0^{6}$ | $66\ 48^{5}$ | 9: |
| | 10 | | |
| *1* | $10\cdot0^{3}$ | $64\ 34^{7}$ | 19 |

(1) $>35''$.
(2) $<15''$.
(3) $20''$.
(4) Large Magellanic Cloud, the position is that of the centroid.
(5) $\sim30''$.
(6) 30 Doradus, $>40''$.
(7) Perhaps a side lobe of 03S3A.

TABLE 2 (*Continued*)

| Ref. No. | Position (1950) R.A. h m | Position (1950) Dec. S. ° ′ | Flux Density ($10^{-26}$ Wm$^{-2}$ (c/s)$^{-1}$) |
|---|---|---|---|
| | 11 | | |
| *1* | 00·0$^{3}$ | 60 36$^{4}$ | 162[8] |
| *2* | 10·2$^{6}$ | 60 38$^{6}$ | 42[9] |
| *3* | 34·0$^{7}$ | 62 26$^{8}$ | 100: (50)[9a] |
| *4* | 36·4$^{6}$ | 67 54$^{7}$ | 34[10] |
| *5* | 37·0$^{5}$ | 63 02$^{7}$ | 38[11] |
| *6* | 51·8$^{6}$ | 69 17$^{6}$ | 15 |
| | 12 | | |
| *1* | 10·5$^{3}$ | 62 25$^{5}$ | *140* (112) |
| *2* | 15·3$^{5}$ | 61 29$^{5}$ | 18 |
| *3* | 17·4$^{8}$ | 63 40$^{8}$ | 30: |
| *4* | 39·7$^{5}$ | 61 42$^{5}$ | 26 |
| | 13 | | |
| *1* | 10·0$^{4}$ | 64 08$^{5}$ | 24 |
| *2* | 43·4$^{1}$ | 60 07$^{2}$ | 795[12] |
| *3* | 57·7$^{5}$ | 63 41$^{6}$ | 20:[13] |
| | 14 | | |
| *1* | 06·3$^{5}$ | 61 24$^{6}$ | *196*: (69) |
| *2* | 09·9$^{5}$ | 65 05$^{7}$ | 35: |
| *3* | 38·9$^{3}$ | 62 24$^{6}$ | 110[14] |
| *4* | 51·9$^{8}$ | 60 50$^{10}$ | *147* : (84) |
| | 15 | | |
| *1* | 28·0$^{4}$ | 60 50$^{7}$ | *81* (55)[15] |
| | 16 | | |
| *1* | 10·2$^{1}$ | 60 45$^{2}$ | 1190[16] |
| *2* | 33·8$^{8}$ | 61 47$^{7}$ | 30:: |
| *3* | 59·9$^{5}$ | 62 32$^{6}$ | 18[17] |
| | 17 | | |
| *1* | 13·4$^{8}$ | 62 10$^{6}$ | 35:[18] |
| | 18 | | |
| *1* | 16·2$^{3}$ | 64 00$^{4}$ | 71[19] |
| *2* | 42·4$^{8}$ | 60 40$^{7}$ | 9 |
| | 19 | | |
| *1* | 21·3$^{5}$ | 62 30$^{10}$ | 12† |
| | 20 | | |
| *1* | 41·2$^{3}$ | 60 23$^{4}$ | 55[20] |
| *2* | 59·2$^{4}$ | 64 03$^{6}$ | 17 |
| | 21 | | |
| *1* | 00·2$^{8}$ | 61 36$^{7}$ | 8 |
| *2* | 17·5$^{8}$ | 67 00$^{10}$ | 9: |
| *3* | 26·5:: | 61 13:: | 8: |
| *4* | 52·9$^{2}$ | 69 58$^{3}$ | 253[21] |
| | 22 | | |
| *1* | 17·1$^{8}$ | 63 52$^{10}$ | 11 |
| *2* | 38·3$^{5}$ | 61 01$^{5}$ | 14 |
| *3* | 53·9$^{4}$ | 65 14$^{6}$ | 19 |
| *4* | 55·8$^{5}$ | 67 54$^{8}$ | 13 |
| *5* | 56·1$^{8}$ | 63 52$^{10}$ | 8 |
| | 23 | | |
| *1* | 13·3$^{4}$ | 62 24$^{8}$ | 14: |
| *2* | 20·1$^{6}$ | 60 50$^{10}$ | 10 |
| *3* | 33·0$^{6}$ | 66 55$^{6}$ | 26 |
| *4* | 56·0$^{2}$ | 61 08$^{3}$ | 296[22] |

(8) NGC 3503, $>50''$.
(9) (S38a), $>40''$.
(9a) BBW2620.
(10) $>35''$.
(11) $>35''$.
(12) IAU 13S6A, $65''$.
(13) Possibly interference from IAU 16S6A.
(14) $>40''$.
(15) Perhaps a galactic irregularity.
(16) IAU 16S6A, $\geqslant 70''$.
(17) Perhaps a background irregularity.
(18) Perhaps a background irregularity.
(19) $\leqslant 20''$.
(20) $<15''$.
(21) $25''$.
(22) $40''$.

Table 3

SOURCES SOUTH OF DECLINATION —70°

Sources which may be "extended", that is resolvable, are indicated by a dagger. A colon is placed beside uncertain flux densities. Angular sizes, where available, are indicated in the footnotes

| Ref. No. | Position (1950) R.A. h m | Position (1950) Dec. S. ° ′ | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) | Ref. No. | Position (1950) R.A. h m | Position (1950) Dec. S. ° ′ | Flux Density ($10^{-26}$ $Wm^{-2}$ $(c/s)^{-1}$) |
|---|---|---|---|---|---|---|---|
| *1* | 00 54 : | 72 42 : | *550*: (37)(1) | *1* | 12 $28\cdot1^{8}$ | 70 $16^{8}$ | 19 |
| *1* | 01 $59\cdot7^{10}$ | 76 $02^{10}$ | 18:† | *1* | 15 $28\cdot9^{5}$ | 74 $07^{7}$ | 20(4) |
| *1* | 02 $21\cdot3^{5}$ | 70 $50^{7}$ | 30 | *1* | 16 $22\cdot6^{8}$ | 75 $11^{7}$ | 38 |
| *2* | 02 $52\cdot0^{6}$ | 70 $52^{8}$ | 7: | *1* | 17 $21\cdot2^{5}$ | 70 $01^{8}$ | 46 |
| *1* | 04 $09\cdot4^{3}$ | 75 $08^{4}$ | 87(2) | *1* | 18 $11\cdot8^{10}$ | 77 $25^{10}$ | 18:(5) |
| *2* | 04 $24\cdot3^{6}$ | 72 $39^{8}$ | 11 | *1* | 20 $28\cdot0^{8}$ | 73 $13^{6}$ | 18:(6) |
| *1* | 06 $36\cdot0^{6}$ | 75 $04^{7}$ | 20 | *1* | 22 $44\cdot3^{8}$ | 77 $19^{10}$ | 43(7) |
| *1* | 07 $28\cdot7^{5}$ | 70 $11^{8}$ | 11 | | | | |
| *1* | 08 $43\cdot1^{5}$ | 75 $31^{7}$ | 58(3) | | | | |

(1) Small Magellanic Cloud, the position is that of the centroid.
(2) $<20''$.
(3) $<20''$.
(4) Perhaps a background irregularity.
(5) A doubtful source.
(6) A doubtful source.
(7) A doubtful source.

NGC 6584, comparatively close to the radio source 18–*52*; however, there is no reason for thinking that this is other than an accidental coincidence.

Examination of the tables shows that the new possible identifications are not numerous. Only one galaxy has not been noted before (I 5063), although there are four new H II regions observed. In general, comparisons of radio and optical catalogues are not very satisfactory for studying H II regions because these are often not isolated objects. It is usually better to compare radio and optical isophotes, e.g. for the region of this catalogue the radio isophotes of Hill, Slee, and Mills (1958) and the H$\alpha$ isophotes of Johnson (1960).

TABLE 4

POSSIBLE IDENTIFICATIONS WITH EMISSION NEBULAE

| Radio Source | Emission Nebulae | Notes |
|---|---|---|
| 05–66 | NGC 2270 | 30 Doradus, an emission nebula in the Large Magellanic Cloud. This is a well-known identification |
| 10–57 | NGC 3372 | $\eta$ Carinae nebula, a well-known identification |
| 11–61 | NGC 3503 } | An area displaying a complex H II distribution |
| 11–62 | S 38a* } | |
| 11–63 | BBW 26201† | This is given as two separate nebulae, S 40* and S 42,* by Gum |
| 15–52 | BBW 28802† | |

* Gum (1955).

† Bok, Bester, and Wade (1955).

A number of fields containing radio sources listed in the catalogue have been photographed by Basinski, Bok, and Gottlieb (1959). No clear identifications emerge from these photographs, although in a few cases the radio positions correspond with clusters of galaxies, i.e. the sources 04–54 (probably identified with a cluster member I 2082—see Table 5), 16–61, and 23–64: these sources undoubtedly need further investigation. The sources 04–54 and 03–52 have previously been noted as corresponding with cluster positions (Mills 1959).

## IV. DISCUSSION

The number of radio sources included in the present catalogue represents only about one-tenth of the total: consequently the effect of adding these results to the previous statistics (Mills, Slee, and Hill 1960) is negligible. The conclusion reached before is therefore not altered; that is, the statistics of the

TABLE 5

POSSIBLE IDENTIFICATIONS WITH BRIGHT GALAXIES

| Radio Source | Galaxy Catalogue No. | Type | $m_{1\cdot 9}-m_p$ | Notes |
|---|---|---|---|---|
| 00–71 | S.M.C. | Irr. | 2·8 | The Small Magellanic Cloud is a well-known identification |
| 04–54 | I 2082 | | —7 | A double galaxy of about magnitude 15 in a cluster: this appears a very probable identification |
| 05–63 | L.M.C. | Irr. | 3·0 | The Large Magellanic Cloud is a well-known identification |
| 20–57 | I 5063 | E 2 | —2·8 | The position agreement is relatively close, but there is no confirmatory evidence |

source counts, when due allowance is made for instrumental effects, show no significant departures from those expected with a random distribution of sources in a static Euclidean universe. They are also not inconsistent with the counts expected in a relativistic expanding universe. The sensitivity of the instrument is inadequate for a definitive result in cosmology based on source counts alone: it seems likely that this method will require numbers of well-determined radio sources approaching 10 000 per steradian, at least, to succeed.

Summarizing the identification situation, we find that in the three published catalogues, totalling 2270 sources, some 28 bright galaxies, 11 emission nebulae, and 2 supernovae remnants have been listed as possible identifications. We have also found two relatively close coincidences with globular clusters, but this is about the number expected by chance. A search for identifications involving fainter galaxies and clusters of galaxies has been carried out in selected portions of the catalogues (Mills 1960); this has produced about 90 additional possible identifications with faint galaxies (many of them double systems) and 55 possible identifications with clusters of galaxies (or individual galaxies within the cluster). A certain proportion of all these possible identifications represent chance coincidences, as discussed in the papers concerned. The great majority of radio sources, however, remain unidentified.

At high galactic latitudes the sparsity of identification is consistent with the form of radio luminosity function proposed by Mills (1960) and subsequently elaborated by Bolton (1960) and Minkowski (1961). At low latitudes, however, the small number of identifications with galactic objects requires explanation. There is a complete absence of identifications with optical emission nebulae at longitudes greater than 288° (old system) extending through the centre to our northern limit, at longitude 13°. This arises because, at our wavelength of 3·5 m, the nearby bright emission nebulae in this region are seen against a background temperature equal to or greater than their electron temperature and consequently are observed in absorption or not at all: NGC 6357 and probably M8 are in the former category.

In northern declinations inaccessible to our instruments, about a dozen galactic non-thermal sources have been identified with filamentary nebulosities, apparently old supernova remnants. In our southern catalogues, however, only two sources, 08–4*4* and 17–2*11* (Kepler's supernova), can be so identified. This may be due partly to the absence of wide-angle photographic plates of the necessary quality but principally, we feel, to the richness and heavy obscuration of the southern Milky Way, which makes the detection of such objects more difficult.

Finally, we point out that the angular size data included in our catalogues are incomplete (in fact absent in the region +10° to −20°). It is proposed to include the complete observational data in a later publication.

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