

CRC REEF RESEARCH TECHNICAL REPORT

AN ATLAS OF TROPICAL CYCLONES IN THE GREAT BARRIER REEF REGION, 1969-1997

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FOREWORD

Cyclones are among the most important natural agents of disturbance on coral reefs in non-equatorial regions. The severity, extent and frequency of cyclonic damage on the Great Barrier reef is such that almost all reefs have been impacted by cyclones at least once in the last 20 years. Both direct effects such as cyclone generated waves, and indirect effects such as turbid, sediment laden river plumes can substantially alter the physical structure and community composition of reefs. These disturbances create a complex pattern of reef status within the GBR, with different reefs being at various stages of recovery from cyclonic damage. From a management viewpoint, it is important to understand not only the statistical probability of natural damage to reefs in different parts of the GBR, but also to be able to determine which reefs have experienced specific frequencies of cyclonic disturbances in the past, and how long it has been since the last disturbance. This atlas provides just this type of information, and a great deal more, through a comprehensive series of maps and tables. It will be of considerable use to managers wishing to determine the likely status of a particular reef and its vulnerability to further anthropogenic stress.

The production of this atlas came about as a result of a personal request during a CRC annual review of a project to develop detailed predictive models of cyclone damage. This responsiveness on the part of the researcher to the immediate needs of managers is an excellent example of the advantages of the close cooperative relationship which has developed between certain managers and researchers within the Cooperative Research Centre. As an interim product of this CRC project, this atlas will be frequently referred to, both by managers and, I suspect, many researchers.

Jamie Oliver
Monitoring Coordinator
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1. SUMMARY

Tropical cyclones generate high winds, large waves and often massive rainfall that can cause major damage to the coral reefs of the Great Barrier Reef Region (GBRR). Damage to reefs from several recent cyclones has been documented: Winifred (1986); Ivor (1990); Joy (1990); Sadie (1993); Celeste (1996); and Justin (1997). Observed cyclone damage ranged from minor breakage of fragile branching corals to major losses of coral coverage over entire reefs.

This atlas provides a first step towards understanding the risk of cyclone damage to coral reefs and other associated ecosystems of the GBRR by facilitating an examination of the history (climatology) of cyclones across the region over time.

Through an extensive set of maps and charts and relevant background information, this document provides: 1) a compilation of the paths and basic characteristics of tropical cyclones through the GBRR from 1969 to 1997 and 2) an exploration of the spatial and temporal patterns of cyclone activity across the region. As a reference document, this atlas can be used to address a wide range of questions such as:

- What is the history of cyclone activity near a particular location (a reef, a pontoon, an island resort, a port)?
- Was a cyclone nearby at a particular time (could a cyclone have contributed to an observed pattern of damage on a reef, a seagrass bed)?
- Which areas of the GBRR have had the most frequent or the most intense cyclones?

2. ABOUT THIS ATLAS

The purpose of this atlas is 1) to provide a compilation of the paths and basic characteristics of tropical cyclones through the Great Barrier Reef (GBR) Region from 1969 to 1997 (Map 1) and 2) explore spatial and temporal patterns (eg, are cyclones more frequent in certain parts of the GBR?). This is a response to requests for information about cyclones in the GBR such as, “*What cyclones have passed through the GBR over the last 20 years or have passed near Green Island since 1969?*”, “*What was the intensity of Cyclone Charlie at its closest approach to John Brewer Reef?*”, or “*How many cyclones have passed near Rocky Island, and during what months of the year?*”. This document provides enough information to answer these types of questions by providing an extensive set of maps and charts as well as background information about tropical cyclones, how they can impact coral reefs and the spatial and temporal distributions of these impacts.

2.1 MAPS

The irregularly shaped GBR covers over 340,000 km², with individual reefs ranging from 10s of metres to 100s of kilometres in length. Thus, representing cyclone paths over the entire Region and the outlines of the reefs poses quite a challenge. We therefore divided the region into a series of 62 1° latitude by 1° longitude boxes, beginning with 10°S and 142°E and extending to 25°S and 154°E (Map 2). The outlines of the boxes are included on all 129 maps (except Map 1), of which there are four types:

- **Introductory:** an overview of cyclone paths through Queensland waters from 1969-1997 and the map index,
- **Overview of Trends by Box:** the number of cyclones, the length of cyclone paths and the years since the last cyclone per box by cyclone category and by month, the minimum central pressures recorded by month per box, and the recorded directions of cyclone forward motion by month per box from 1969-1997,
- **Yearly Overview:** all the cyclones passing near the GBR Region (within 100 km) separately for each year 1969-1997, and
- **Cyclone Events by Box:** every cyclone from 1969 to 1997 passing through each 2° of longitude and 1° of latitude (each two boxes).

Map 2 (page 27 and back cover fold out) provides a visual index of each 1° latitude by 1° longitude box, to which every map in this atlas is referenced (note: all maps are in the Albers projection). In addition, an Index of Maps (page vi) lists the types and organisation of maps available. With each map is included a brief description and, if appropriate, a graph, chart, or table depicting the underlying data (for example see Map 4). Further, reef names and unique

identifying codes are listed 1) by 1° box (Appendix A) and 2) in alphabetical order (Appendix B). Note that some reefs may 1) fall within more than one box and 2) have the same name. Finally, all named cyclones that passed within 100 km of the GBR region from 1969-1997 are listed by year in Appendix C and by month in Appendix D.

2.2 NOTES ON MAPS AND CHARTS

- **Overview of Trends by Box:** These maps represent trends across the GBR region over the entire time period from 1969 to 1997. Although cyclone data is available from the Bureau of Meteorology from the late 1800's, data prior to 1969 (when satellite tracking of cyclones became widespread) is of dubious quality (Holland 1981) and was not used in this analysis.

By category. These maps show 1) all cyclone paths and areas within 100 km of at least one path separately by category (eg, Map 3) and 2) the number, length, and number of years since the last cyclone path through the GBR by 1° latitude by 1° longitude box (eg, Maps 4, 5, 6). Cyclones located within 100 km of the GBR were determined to be "near" the region as field studies have reported impact to reefs from cyclones located as far away as 100 to 200 km (Done 1992b, Connell et al in press). A cyclone's properties, such as central pressure, category ranking, speed of forward motion and direction, constantly change over the length of the path (See *Introduction to Tropical Cyclones* for an explanation of the basic characteristics of tropical cyclones and Table 2, page 21). To account for this, each cyclone's path was split into segments according to category value estimates made at six-hourly, three-hourly, or one-hourly intervals (spacing of observations by the Bureau of Meteorology depends on the proximity of the cyclone to the coast and its intensity). We assume that cyclones remain the same category between estimates. Note also that no maps are provided for Category 5 cyclones because no such cyclones passed through the GBR Region or even Queensland waters in the period 1969-1997. To get an idea of the frequency and duration of cyclones across the GBR, we calculated the 1) number of cyclones (frequency), 2) total length of cyclone paths (duration) and 3) years since the last cyclone (from 1997) per 1° latitude by 1° longitude box. Due to their often erratic paths, individual cyclones may pass through a box more than once though this was rare (eg, Kerry 1978-79, Map 109). In calculating the frequency of cyclones per box, we counted each cyclone only once. However, the total length of cyclone paths per box

includes the entire path of each cyclone. Charts are provided of these trends by latitude and by 1° latitude by 1° longitude box.

- **By month.** These maps show 1) all cyclone paths and areas within 100 km of at least one path separately by month (eg, Map 35) and 2) the number and length of cyclone paths through the GBR by 1° latitude by 1° longitude box by month (eg, Maps 36, 37). Because cyclones may span more than one month, each cyclone's path was split into segments according to month. Thus a single cyclone may count as being present during more than one month. Charts are provided of these trends by latitude and 1° latitude by 1° longitude box.
- **Central pressure.** These maps show the minimum central pressure recorded for all cyclones in the GBR region by 1° latitude by 1° longitude box by month (eg, Map 53). Note that cyclone pressure is recorded at six, three or one hourly intervals even though cyclones are constantly changing. Thus, it is possible that central pressures lower than those recorded may have occurred. Charts are provided of these trends by latitude and 1° latitude by 1° longitude box.
- **Direction of forward motion.** These maps show the direction of forward motion of cyclones at recorded eye positions in the GBR region by month (eg, Map 60). Each arrow points in the major direction of forward motion (N, NE, E, SE, S, SW, W, NW, N). Cyclone direction could change considerably along a path through a 1° latitude by 1° longitude box. Thus, average values would have little practical meaning and were not calculated by box (eg., a mean direction of south for a box might represent one cyclone moving west and one moving east!). Note also that while cyclone direction between two positions can be inferred by examining the cyclone's entire path, cyclones may move erratically between recorded positions (Holland and Lander 1993).
- **Yearly Overview:** These maps show cyclone paths within Queensland waters separately by year (eg, Map 67). The cyclone season ranges from November of one year to May of the next. Thus, the December 1974 cyclones are shown on the 1975 map, while the December 1975 cyclones are shown on the 1976 map and so on. Each yearly overview map includes 1) a pie chart depicting the percentage of cyclones passing within Queensland waters that track in the vicinity of the GBR and 2) a graph of the Southern Oscillation Index (SOI) by month and averaged over the year.

- **Cyclone Events by Box:** These maps show all cyclone paths 1969-1997 and reefs within every two adjacent 1° latitude by 1° longitude boxes (eg, Map 96). Each map includes a table that lists for each cyclone on the map: 1) name 2) date (day, month, year), 3) maximum category, and 4) minimum central pressure. These values correspond to the cyclone eye position(s) in the cyclone database located within or nearest to the two boxes. Each cyclone path on the map is labelled with the year and a label number which matches the data in the table. Note that the locations of cyclones when they are too weak to be classified a cyclone (as they form and dissipate) are not recorded by the Bureau of Meteorology. Thus, some cyclones appear to have paths that start or end "out of nowhere" on the map.

3. TROPICAL CYCLONES AND THE GREAT BARRIER REEF REGION

3.1 POTENTIAL CYCLONE IMPACTS ON CORAL REEFS

The high winds and subsequent large waves generated by tropical cyclones have the potential to impact a range of Great Barrier Reef ecosystems, particularly those associated with coral reefs. Impacts to coral reefs from cyclone-generated forces, though often extending over 100s of kilometres, are typically patchy at both regional and local scales because 1) cyclone winds and waves are typically stronger on one side of the path, 2) wave energy dissipates as waves break along reefs, creating within and between reef shelter, and 3) individual coral vulnerability to impact varies considerably over small areas (10s of metres).

Types of Impact. Coral reefs sustain both direct and indirect structural damage from breaking waves and wave-borne debris (Done et al. 1991), as well as damage from exposure to fresh water plumes that may accompany a cyclone (DeVantier et al 1997, Brodie et al 1995). Following Cyclone Ivor, Done et al. (1991) found both 1) direct physical damage: damage to the reef matrix (Figure 1), dislodgment of massive coral heads (Figure 2), stripping of soft corals (Figure 3), and breakage of hard coral (Figure 4), and 2) indirect damage from burial by sediments stirred up during the cyclone (Figure 5). Connell et al. (in press) describe changes to the reef flat structure which had a long term impact on reef recovery and survival by changing patterns of water circulation.

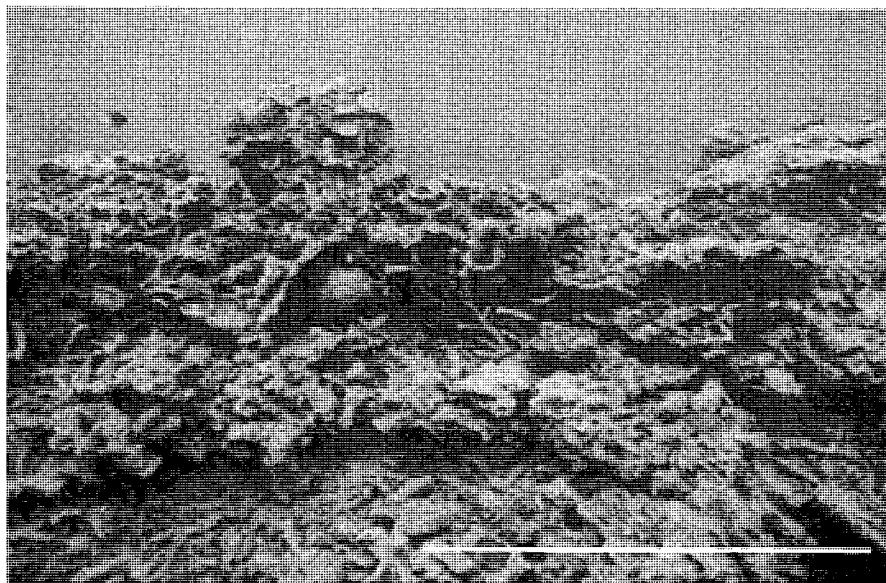


Figure 1: Damage to reef matrix during Cyclone Ivor, 1990. The white bar equals ~50 cm.
Photograph by Dr. Terry Done.

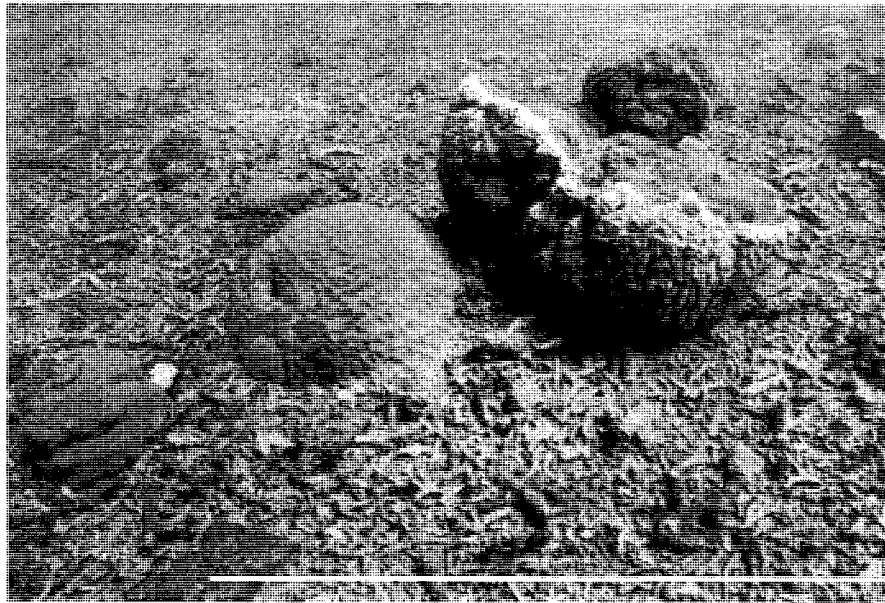


Figure 2: *Dislodgment, breakage, and burial of massive coral heads during Cyclone Ivor, 1990. The white bar equals ~1 metre. Photograph by Dr. Terry Done.*

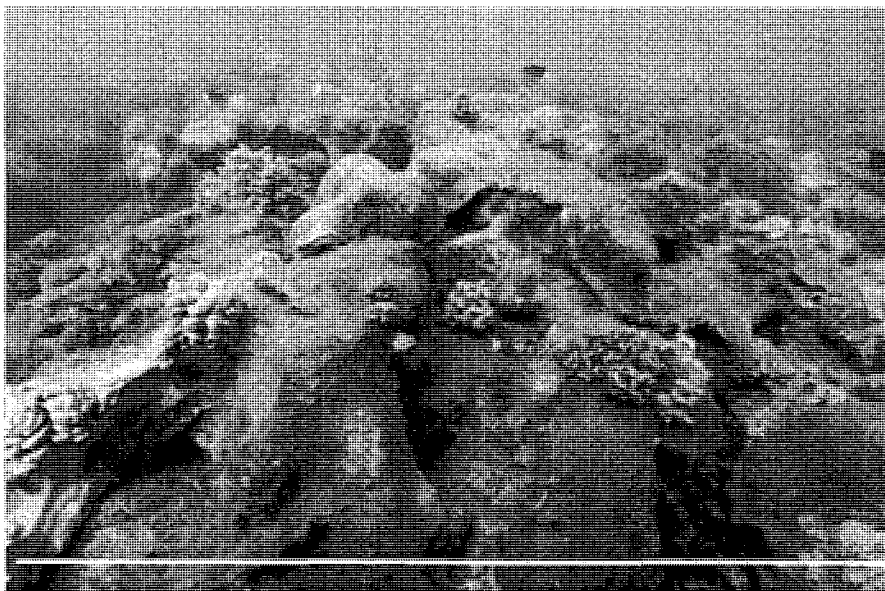


Figure 3: *Stripping of soft corals from the reef framework during Cyclone Ivor, 1990. The white bar equals ~ 1 metre. Photograph by Dr. Terry Done.*

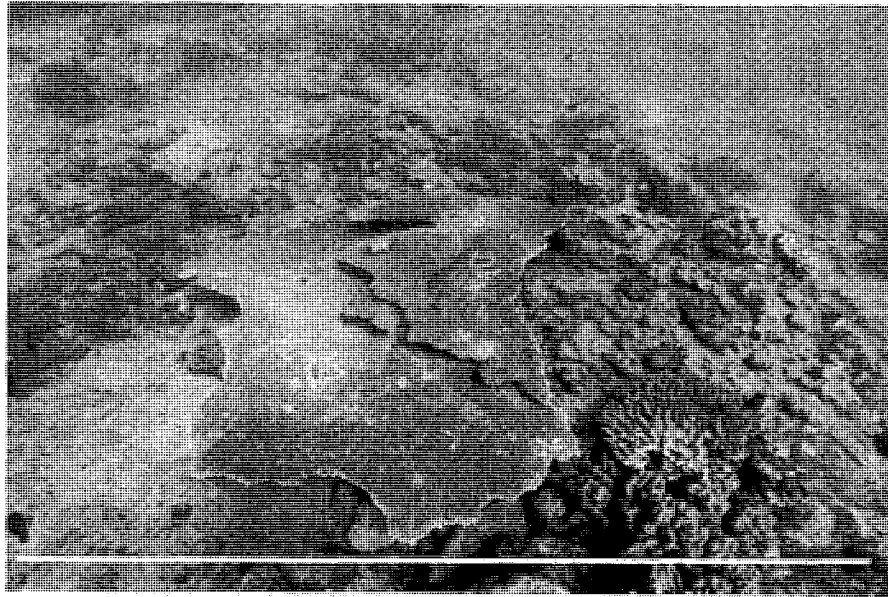


Figure 4: Breakage of a large plate coral during Cyclone Ivor, 1990.
The white bar equals ~ 2.5 metres. Photograph by Dr. Terry Done.

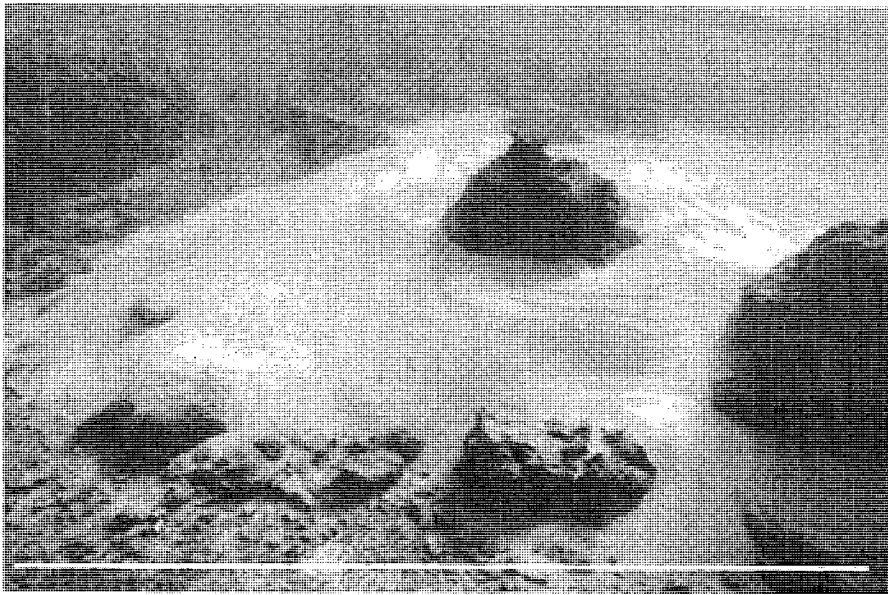


Figure 5: Burial of coral by deposition of sediment resuspended during Cyclone Ivor, 1990.
The white bar equals ~4 metres. Photograph by Dr. Terry Done.

Spatial Characteristics of Impact. Although a single cyclone can impact many reefs in a matter of days, the distribution of impact is typically highly variable or “patchy” at a range of

spatial scales, including between reef complexes (~100s km), between reefs (~10s km), between reef sites (~1 km), and within reef sites (~0.1 km), for the reasons below:

- **BETWEEN REEF COMPLEXES.** Cyclone wind and wave fields are stronger to the left of the cyclone's path in the Southern hemisphere. Thus reefs located on different sides of the cyclone nominal path may experience different levels of wave energy (Figure 6).

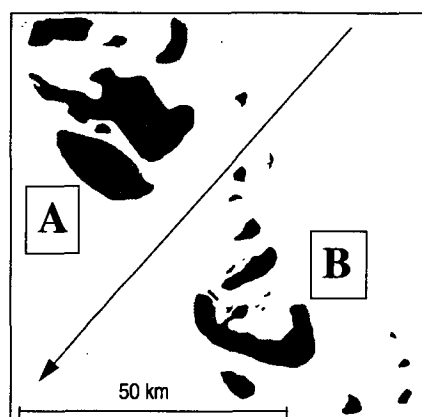


Figure 6: Hypothetical example of the between reef complexes shelter effect. A cyclone moving in the direction of the arrow generates stronger waves to the left of its path. Less wave energy will reach site [A] than site [B].

For example, Done et al. (1991) found reef damage from Cyclone Ivor gradually decreased out to 100 km to the left of the cyclone's path and to 30 km to the right.

- **BETWEEN REEFS.** A significant portion of wave energy is dissipated during breaking at the reef front (Massel 1995). Thus, the positions of reefs with respect to each other and the incoming waves can create a definite "between reef" shelter effect, where one reef "blocks" the others from the bulk of incoming wave energy (Figure 7).

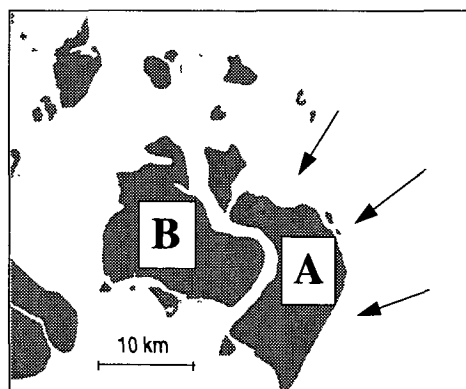


Figure 7: Hypothetical example of "between reef" shelter effects. Waves approaching the reef matrix (arrows) break at site [A] and expend most of their energy, resulting in sheltered conditions at site [B].

- **BETWEEN REEF SITES.** Depending on the size, shape, depth, slope, length relative to wave height and orientation of a reef with respect to incoming waves, wave energy is dissipated and diffracted around reefs (Massel 1995, Denny 1988), often with dramatic differences in levels of impact between the exposed and lee sides of the reef.

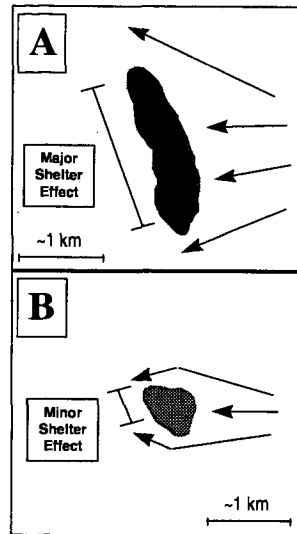


Figure 8: *Hypothetical example of the between reef sites shelter effect. Waves (arrows) dissipate and reflect from [A] creating major shelter, but bend easily around [B] creating only minor shelter.*

- **WITHIN REEF SITES.** The vulnerability of an individual coral to physical damage from cyclone waves depends on a great many factors that are highly variable over small distances (several metres). Thus, cyclone damage across one small area of a reef may range in severity from complete devastation to none. Factors that determine coral vulnerability to cyclone damage include, but are not limited to:
 - the strength of coral attachment to the substratum
 - the nature of the substratum (loose rubble vs consolidated limestone)
 - the coral growth forms present (fragile branching corals vs encrusting or massive heads),
 - the community size structure, as medium-sized corals are more vulnerable to wave dislodgment than their smaller or larger counterparts (Massel and Done 1993), and
 - the ambient wave conditions at the site (sheltered vs exposed).

Temporal Characteristics of Impact. Although a small percentage of the GBR Region's ~3,000 reefs are impacted by cyclones in any given year, over time virtually every reef is likely

to have been affected by at least one cyclone. We found that every location within the GBR Region has been relatively close (within 100 km) to at least one cyclone from 1969 to 1997 (Map 3). In fact, the maximum distance of *any* reef in the GBR to the nearest cyclone from 1969 to 1997 was just over 50 km (Figure 9). For most reefs, the nearest cyclone was a maximum of about 20 to 30 km away. Since physical damage has been documented at reefs

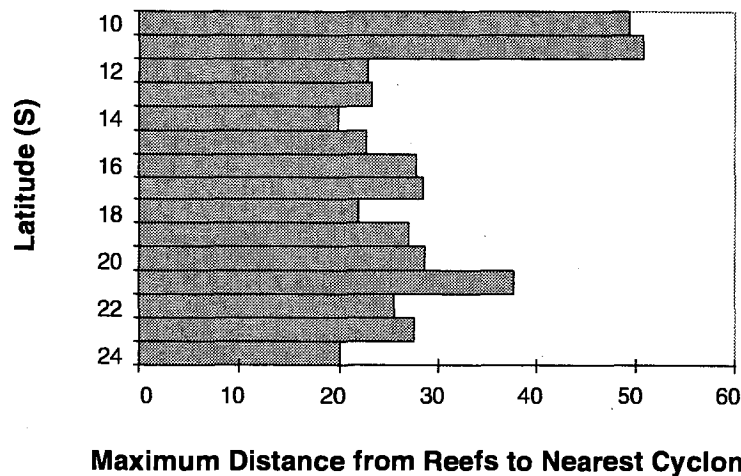


Figure 9: Maximum distance of reefs to the nearest cyclone from 1969 to 1997 in the GBR by latitude.

from cyclones as far away as 100 km (Done 1991) and 200 km (Connell et al in press), this suggests the possibility of widespread low level cyclone impact across the Region over the last 28 years (see Done et al 1991). In addition, many reefs have been affected by fresh water plumes extending over the GBR lagoon due to cyclone floods, such as those following Cyclone Sadie in 1993 (DeVantier et al 1997). The patterns of impact created by cyclones across the GBR region over time depends largely on: 1) the frequency of cyclones of various intensities (return times), and 2) the history of disturbance of each reef site.

Return Times. As a “pulse” disturbance, cyclone waves impact reefs within a very short time period, and repeat at time scales ranging from years to decades, depending on their intensity. The frequency of cyclones in a particular area can be measured by predicting the number of years likely to pass between successive cyclones (return time). Our results suggest that cyclones generally occur most frequently between 12°S and 20°S (Map 4) and that the most intense cyclones (categories four and five) are relatively rare in the GBR region (Map 32). Massel and Done (1993) found that as cyclones become more intense, they have longer return times in the GBR region (Figure 10). In addition, they found that the most intense cyclones return most frequently between about 19°S and 22°S.

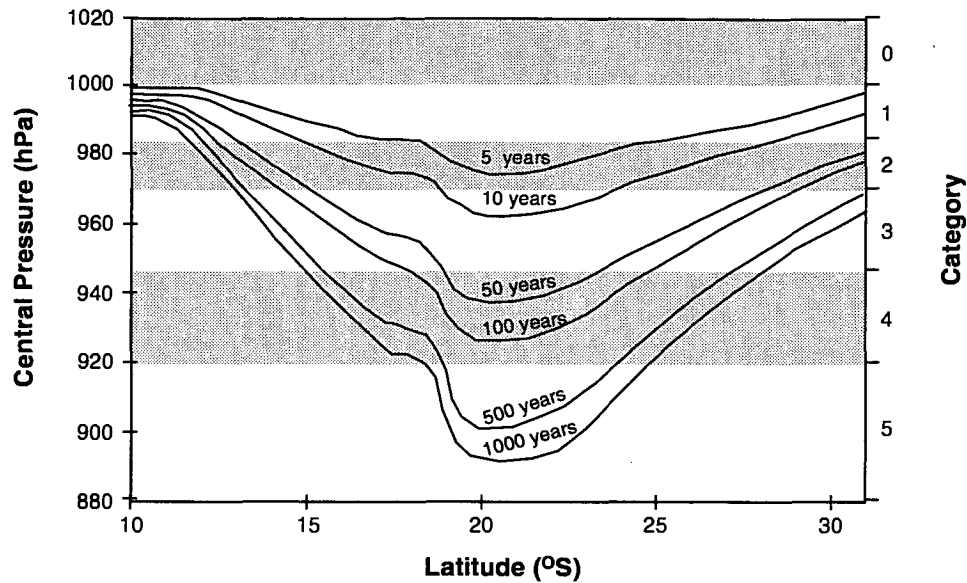


Figure 10: Plot of expected return interval (T) for cyclones of indicated central pressures and categories at latitudes 10-20°S on the east coast of Australia. Adapted from Massel and Done 1993.

Importance of History. The impact of a particular cyclone on a given reef site often depends just as much on the history of previous cyclones as on the characteristics of the cyclone itself (Karlson and Hurd 1993, Done 1992a & b, Hughes 1989). Individual corals on reefs become more vulnerable to storm waves as they grow larger in size (Figure 11). Thus, corals at reef

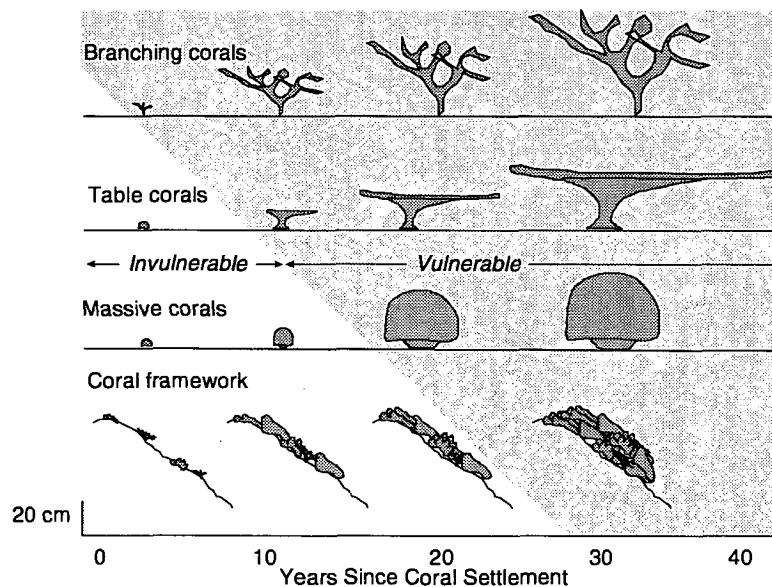


Figure 11: Diagram showing postulated differences in time to vulnerability to storm waves of different coral growth forms and structures, assuming area was denuded in 1950. Adapted from Done 1992b.

sites recently damaged by cyclones (less time to grow) may be less vulnerable to further damage. At some reef sites, massive corals (eg, *Porites* sp.) may remain undisturbed so long

that they reach a size that is essentially invulnerable to normal cyclone-generated waves (Massel and Done 1993, Done 1992b). In this way, in the long term (decades to centuries), intermediate levels of cyclone impact may actually enhance coral reef diversity (Connell 1978, Hughes 1989) by opening up space for colonization for a range of species.

To get an idea of how long GBR reefs have been undisturbed by cyclones, we calculated the number of years since the last cyclone passed through the GBR post 1969. Weak cyclones have visited the region more recently than strong cyclones (Figure 12), with the most recent

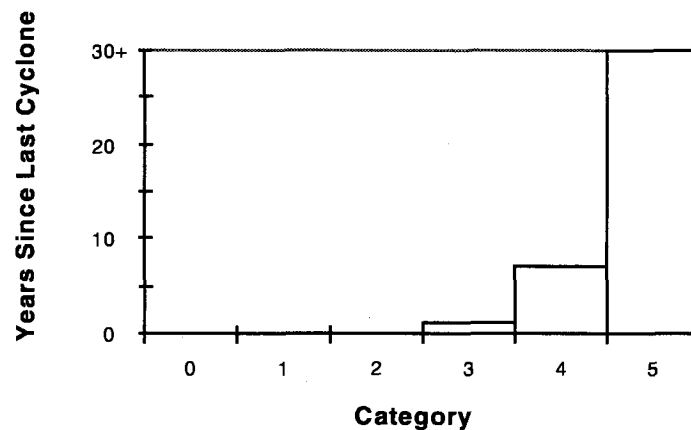


Figure 12: Years before 1997 since the last cyclone by category has passed near the GBR region.

weak cyclones (Gillian, Ita, and Justin) passing through the GBR this season (1996-1997). The most recent strong cyclones (Figure 13) in the GBR passed between Lizard Island and

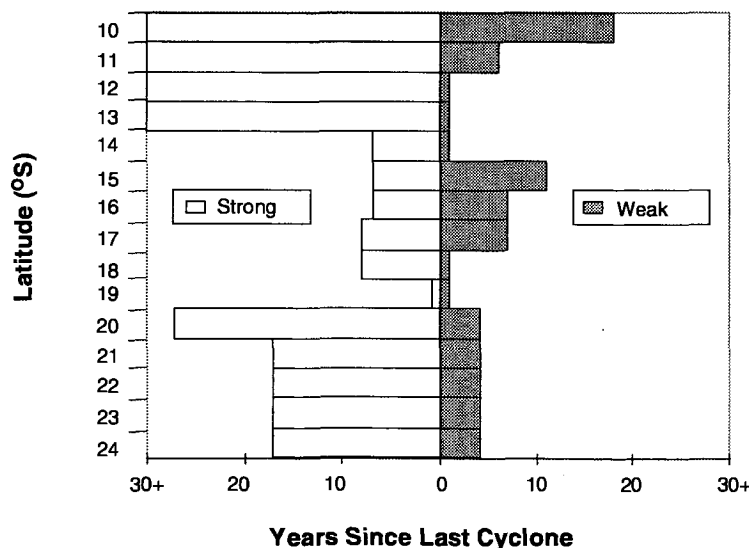


Figure 13: Years since the last weak and strong cyclones have passed near the GBR by latitude (from 1997).

Townsville (14°S and 20°S), with no strong cyclones recorded in the far north (10°S to 13°S) from 1969 to 1997. In contrast, the most recent weak cyclones passed through the north (12°S to 14°S) and near Townsville (18°S to 19°S). Finally, weak cyclones visited the southern GBR (20°S to 24°S) much more recently than strong cyclones.

3.2 INTRODUCTION TO TROPICAL CYCLONES

The Australian Bureau of Meteorology defines a tropical cyclone as a “non-frontal synoptic scale cyclonic rotational low pressure system of tropical origin, in which 10 minute mean winds of at least 17.5 m/s (gale force) occur [with] the belt of maximum winds being in the vicinity of the system’s centre” (McBride and Keenan 1982). Thus, cyclones (Figure 14) are

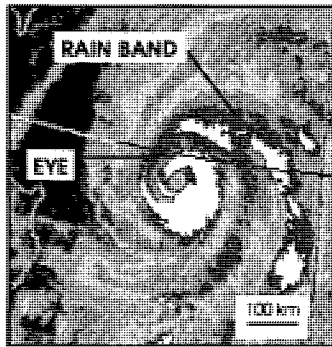


Figure 14: *Simplified profile of a typical tropical cyclone.*
Adapted from Willoughby 1988.

characterised by inward spiralling winds that create wide rain bands around the storm. The highest winds enclose a roughly circular region of relative calm known as the “eye”, which typically has a radius between 10-40 km (Willoughby 1988). Wind intensity gradually increases from near zero within the cyclone eye to a maximum velocity just outside the eye wall (termed the radius of maximum winds). For most cyclones, wind speeds decrease very rapidly with distance outward from the radius of maximum winds (Holland 1981). Occasionally, however, exceptionally small (Cyclone Ada 1970) or large (Cyclone Justin 1997) cyclones develop, where wind speeds decrease more rapidly or less rapidly with distance outward from the radius of maximum winds. The size of the cyclone does not necessarily relate to its intensity. However, the highest winds of a large storm of a given intensity will cover broader area than normal (Callaghan pers. comm.). Finally, cyclone wind speeds and wave heights tend to be highest on the left side of the cyclone path in the southern hemisphere (Young and Hardy 1993) except when cyclones move very slowly or not at all (Young 1988), which is rare.

Tropical Cyclone Formation. Cyclones form over areas of warm open ocean, and develop from pre-existing cloud clusters in these regions. In the Australian region, this confines the formation of the majority of cyclones (~95%) to an area roughly between 9° S and 19° S (McBride and Keenan 1982). Since cyclones rarely form with sea surface temperatures under 26.5°C (McBride and Keenan 1982), the cyclone season in southwest Pacific / Australian region generally extends from November to May, with a peak in January and/or February (Holland 1984, McBride and Keenan 1982). Accordingly, we found that from 1969-1997

cyclones moved near the GBR from December to April, with a peak between January and March (Figure 15). In addition, we found that during the most intense months of the season

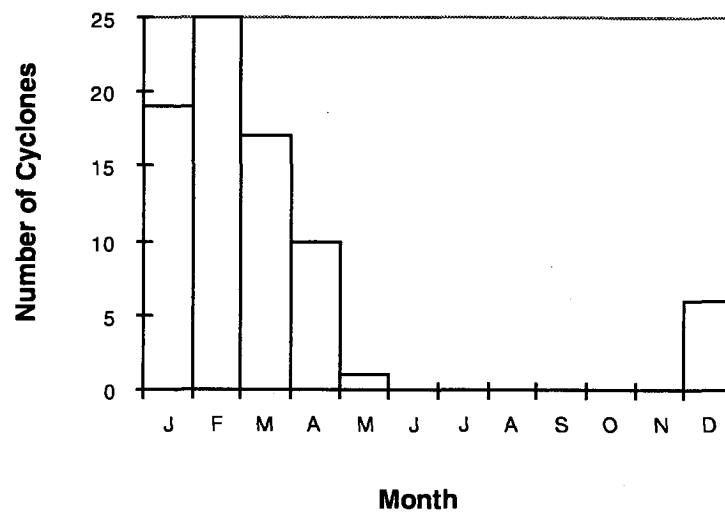


Figure 15: Number of cyclones in the GBR region by month, 1969-1997.

(January, February, March, April), cyclones covered nearly the entire GBR (Maps 38, 41, 44, 47). The far northern area between 10°S and 11°S , however, was crossed by only two cyclones (Stan 1979 and Faith 1972) during April (Map 47). December cyclones were concentrated between 13°S and 14°S and 15°S and 21°S (Map 35). May cyclones were limited to 12°S - 13°S (Map 50).

Tropical Cyclone Movement. Cyclones are sustained in part by their movement over warm water and they quickly weaken once they move over land or cold water. However, relatively small exposed land areas, such as reef tops and continental islands have little effect on the strength of a cyclone. Although in the southwest Pacific the majority of cyclones move in a southeasterly direction (Holland 1984a & b), the most intense storms often move westward towards the north Queensland coast before recurving to the southeast (Holland 1984c). More than half of these cyclones decay at sea, and most of those that cross land are weakening (Holland 1984b & c).

Predicting the path of any given cyclone is very difficult as cyclone paths can be erratic at time scales of hours to days and space scales of tens to hundreds of kilometres (Holland and Lander 1993). Particularly difficult is determining, in real time, when a change in cyclone direction represents a transient detour versus a substantial track change (Holland and Lander 1993).

Cyclone paths can be affected by interactions both between the storm and the surrounding environment, such as the presence of other tropical cyclones, large and meso-scale atmospheric features (eg., trade winds, subtropical ridge), or by moving over land (Holland and Lander 1993), and by factors within the storm itself due to changes in the structure of the eye (Willoughby 1990).

The number, location, and intensity of cyclones in Australian waters varies considerably within and between years due to variations in sea surface temperatures, local air circulation, and the El Nino / Southern Oscillation cycle (Holland 1983, McBride and Keenan 1982). For example, from 1969 to 1997, 135 cyclones moved through Queensland waters with an average of 4.7 ± 2.1 cyclones per year (Table 1). Of these, 80 (57%) passed in or within

<i>Region</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Range</i>	<i>Total</i>
Queensland	4.7	2.1	2-9	135
GBR region	2.76	1.5	0-6	80
Northern GBR	1	1.1	0-4	29
Central GBR	1.41	1.12	0-4	40
Southern GBR	1	1.13	0-4	29

Table 1: *Number of tropical cyclones per year from 1969-1997 by region.*
Note that some cyclones may pass within more than one region.

100 km of the GBR region, with an average of 2.76 ± 1.5 cyclones per season. Half of these passed within the central portion of the GBR (15°S - 19°S), while 36% passed within the northern (10°S - 15°S) and southern (19°S - 24°S) portions, respectively. Although considerably more cyclones passed through the central region of the GBR over the entire time period, the average number of cyclones per year was near one for each region. Similarly, the number of cyclones per season ranged from zero to four within each section of the GBR. For the GBR region as a whole, the number of cyclones ranged from zero to six, while between two and nine cyclones passed through Queensland waters per season.

The link between El Nino events and the location of cyclone paths has been explored in many recent studies (Lough 1994, Nicholls 1992, Garden et al. 1989, Dong 1988, Emanuel 1987,

Revell 1986, Chan 1985), generally suggesting that cyclones tend to form further out in the Coral Sea (eastward) during strong El Nino events due to lower than normal sea surface temperatures near the Queensland coast. However, since many factors influence the movement of cyclones once formed, the Southern Oscillation Index (SOI) alone cannot be used to predict how many cyclones will track near the GBR. To examine how the number of cyclones passing near or within the GBR region varied with the SOI from 1969-1997, we found: 1) the difference between the number of cyclones near the GBR each season and the previous season and 2) the difference between the mean SOI value for the months of the current and previous cyclone seasons (Maps 67-94). We found that, with the exception of the 1990-1991 season, when SOI values increased from the previous season, the number of cyclones tracking within or near the GBR increased (Figure 16). Similarly, when SOI values declined from the previous season, fewer cyclones tracked near or within the GBR. However, the magnitude of increase and decrease in the number of cyclones from the previous season varied little with differences in the magnitude of changes in SOI values (eg, similar numbers of additional cyclones were recorded for large and small changes in SOI). In addition, a variable lag is evident between the number of cyclones and the SOI values. No consistent pattern in the direction of the lag is evident, which makes sense given that so many

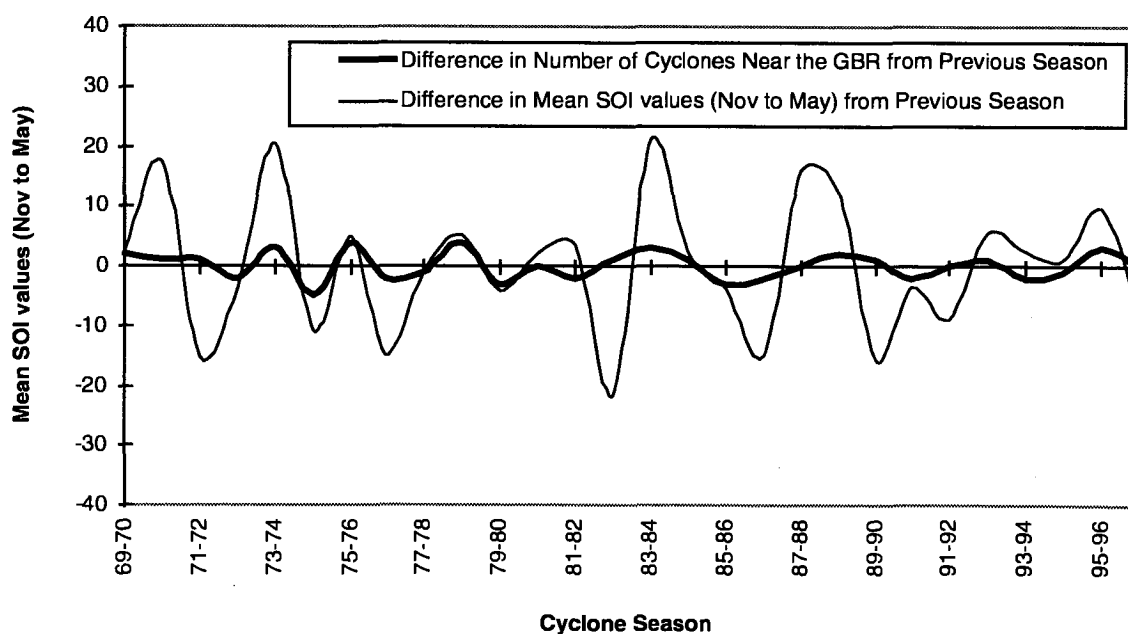


Figure 16: Difference in the number of cyclones passing near the GBR region each season from the previous season (thick line) and the difference between mean values of the Southern Oscillation Index (SOI) for the months of the cyclone season (November-May) each season from the previous season (thin line). Data source: Bureau of Meteorology, 1997.

highly variable factors affect whether or not a cyclone forms and tracks near the GBR region even when the SOI indicates that conditions for cyclone presence are favourable.

Tropical Cyclone Tracking in Australia. Cyclone forces are rarely measured directly due to the obvious dangers posed by high winds and waves, the tendency of instruments to fail when maximum conditions are reached, and the difficulty of predicting where a cyclone will move. Although it is possible to obtain direct measurements by flying through storms with specially designed aircraft, in Australia this has only been done for two cyclones, Kerry and Rosa in 1978-79 (Lourensz 1981). Meteorologists rely on land-based radar, satellite imagery (Dvorak 1975), and observations from ships and remote automatic weather stations at reefs to detect and estimate the basic characteristics of cyclones, such as their location, central pressure, and radius of maximum winds (Lourensz 1981). They have developed a range of mathematical models for predicting the magnitude of cyclone-generated forces (winds and waves) from these basic storm characteristics (eg., Young 1988, Holland 1980).

The Australian Cyclone Database. The Severe Weather Section of the Queensland Bureau of Meteorology maintains an extensive digital database of cyclones passing near the Queensland coast dating back as early as the turn of the century (Davidson and Dargie 1996). The estimated location of each cyclone at 6 hourly, 3 hourly or 1 hourly intervals is provided, along with central pressure, speed and direction measurements and category ranking. This data is provided free of charge for research purposes.

However, there is considerable error in the cyclone database due to the lack of direct observations (Davidson and Dargie 1996, Holland 1981). For example, even today, pinpointing the location of the storm's eye at any given time is based on subjective analysis of satellite and radar imagery and observations from ships and weather stations. Tracking the location of storms is typically easier for more intense storms (Figure 17), as the cyclone eye

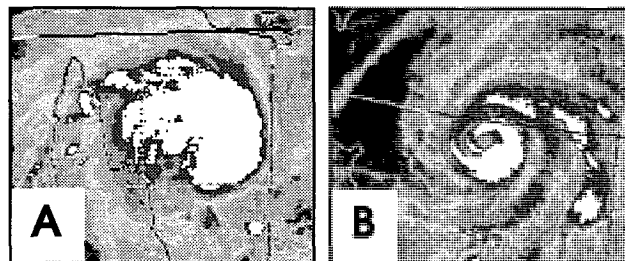


Figure 17: *Satellite images of tropical cyclone eyes. Note that though the cyclones are of similar intensity, in [b] the eye is clearly visible, and in [a] it is obscured by upper atmosphere clouds.*

usually becomes more clearly defined as the storm strengthens (Holland 1981), though high level cloud may obscure even a well-defined eye. Cyclones that track closer to land (eg., fall within range of coastal radar) can be analysed with greater accuracy. A detailed examination of the quality of the Australian tropical cyclone database found that before 1969, when satellite imagery became widely available, meteorologists had great difficulty in detecting and tracking cyclones beyond radar range (Holland 1981). This is the reason we have limited our study to those cyclones from 1969 to 1997. For these cyclones, Holland (1981) estimates errors in the position of the cyclone eye from ± 20 -50 km for storms within 500 km of the coast, and 50-100 km for storms beyond. In addition, central pressures are typically overestimated by up to 15 hPa (underestimating cyclone intensity), and error estimates are themselves uncertain. Current research is investigating ways of reducing errors in the database (Davidson and Dargie 1996).

Tropical Cyclone Intensity. Cyclones are powered by the difference in pressure between the center of the storm (central pressure) and the ambient environment. Since variations in the ambient pressure are typically minimal, the central pressure alone provides a reasonable indication of cyclone intensity. Cyclones intensify as central pressures fall. The lowest central pressure on record (Typhoon Tip) was 888 hPa, recorded in the North Pacific in 1979. Cyclones near the GBR region are typically far weaker (Figure 18). Since 1969, the minimum central pressure recorded was 940 hPa, Cyclone Joy, December 1990.

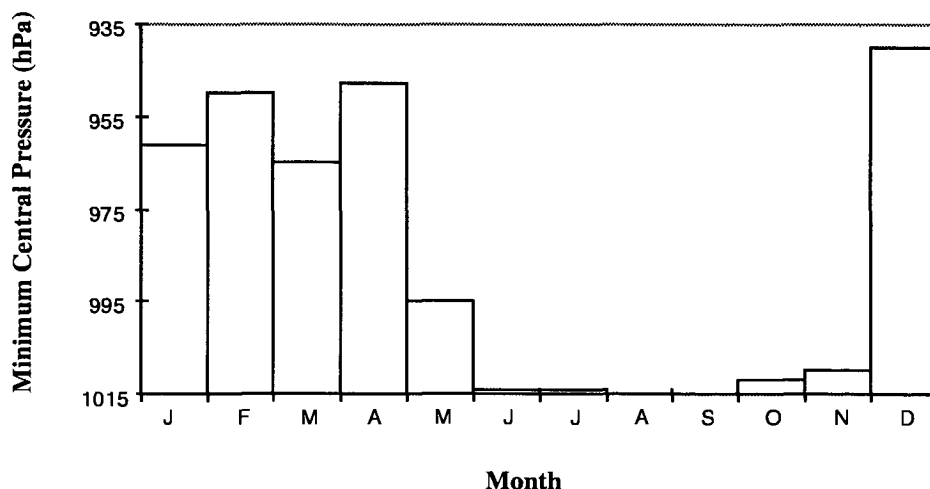


Figure 18: Minimum central pressures recorded in the GBR by month, 1969-1997.

Tropical Cyclone Categories. The Australian Bureau of Meteorology rank cyclones based on central pressure and maximum wind speeds (Table 2). In other parts of the world (eg, the

USA), another system, the Saffir-Simpson scale (Simpson and Riehl 1981) is used. Note that category 1 on the Saffir-Simpson scale is roughly equivalent to category 3 on the Australian

Category	Average Wind (m/s)	Strongest Gust (m/s)	Central Pressure (hPa)
0	At least 17	-	~1000
1	17-25	<35	1000-985
2	25-33	35-47	985-970
3	33-44	47-62	970-945
4	44-56	62-78	945-920
5	>56	>78	<920

Table 2: The Australian scale for ranking cyclone intensity by central pressure and maximum wind speeds.

scale. We found that weak (categories 0, 1, 2) cyclones have been much more common in the GBR region between 1969 and 1997 than strong (categories 3, 4, 5) cyclones (Figure 19). In fact, only two cyclones have intensified to category four and none to category five.

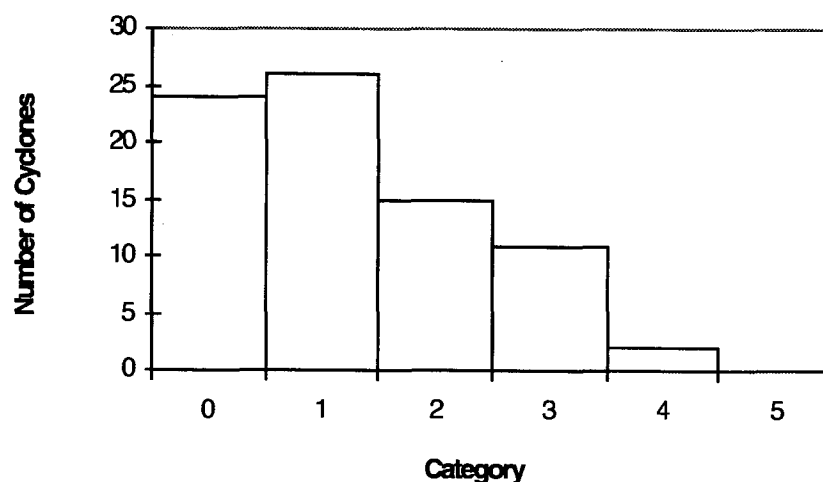


Figure 19: Number of cyclones by maximum category near the GBR region, 1969-1997.

Weak cyclones have covered most of the GBR (Maps 7, 15, 19, 23), while strong cyclones have been more concentrated:

- no category three storms have occurred north of 14°S (Map 11, 27),
- category four storms have been limited to 15-19°S (Map 11, 31).

However, both weak and strong cyclones have been relatively rare between 10°S and 11°S (Figure 20), where only two weak cyclones have passed from 1969-1997 (Stan 1979 and

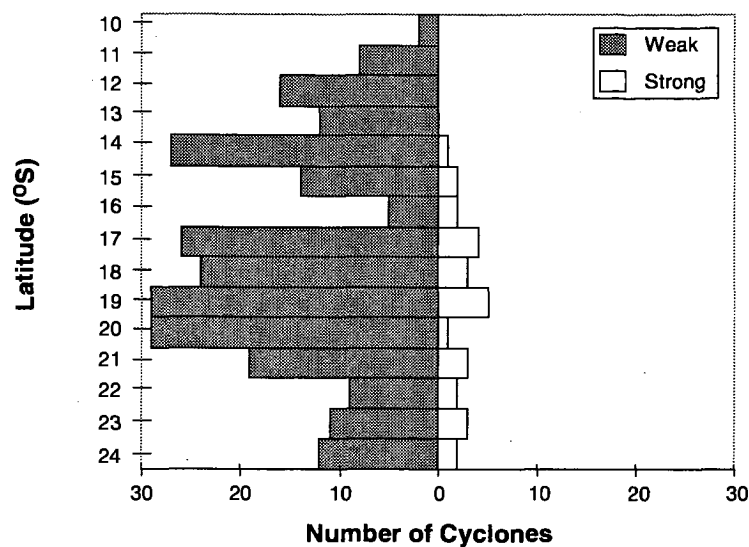


Figure 20: Number of weak (categories 0, 1, 2) and strong (categories 3, 4, 5) cyclones near the GBR region by latitude from 1969-1997.

Faith 1972). The maximum category reached by cyclones in the GBR region from 1969-1997 also varied by month (Figure 21). With the exception of May, each month of the

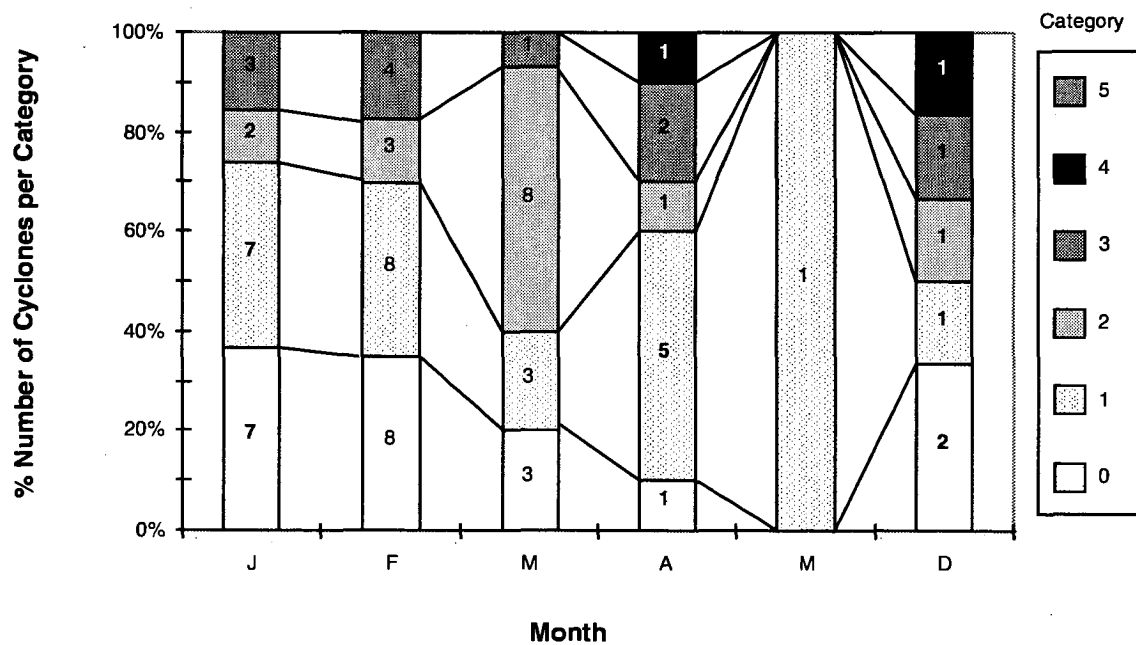


Figure 21: Percentage of the total number of all cyclones in each category per month in the GBR region, 1969-1997. Values indicate the number of cyclones in each category for each month.

cyclone season included at least one of each of the weaker categories. In contrast, although category three cyclones occurred every month except April, only two category four cyclones have passed near the GBR region since 1969; Cyclone Aivu in April 1989 and Cyclone Joy in

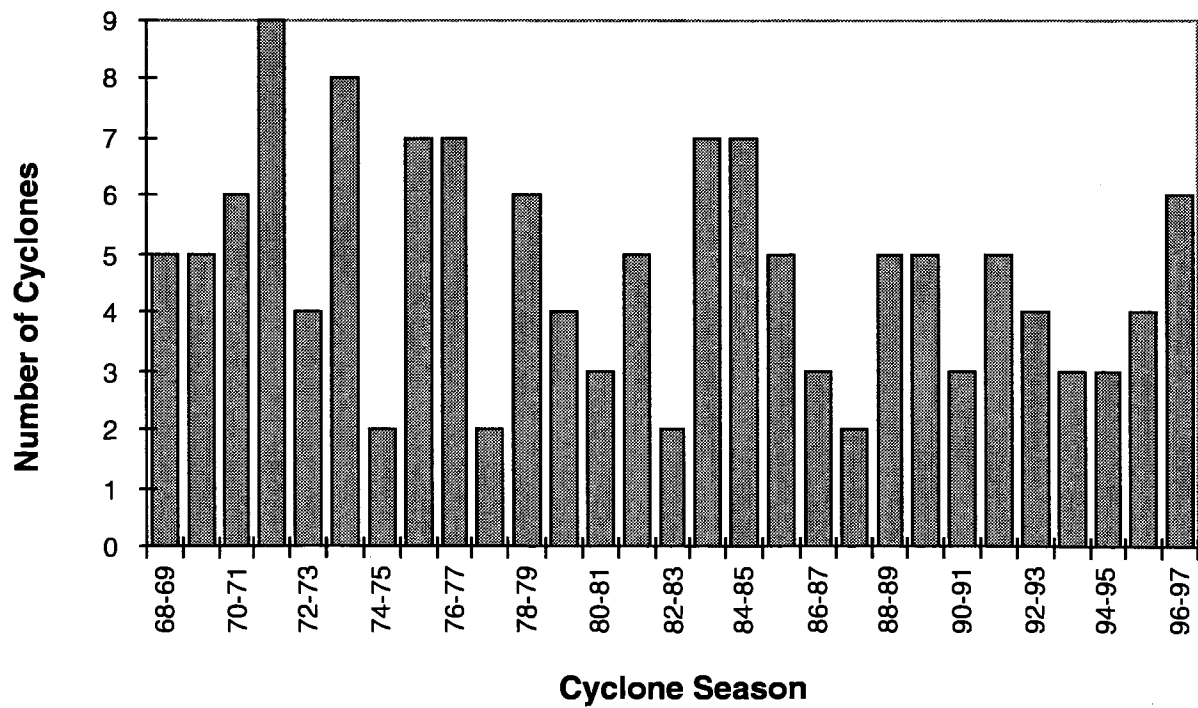
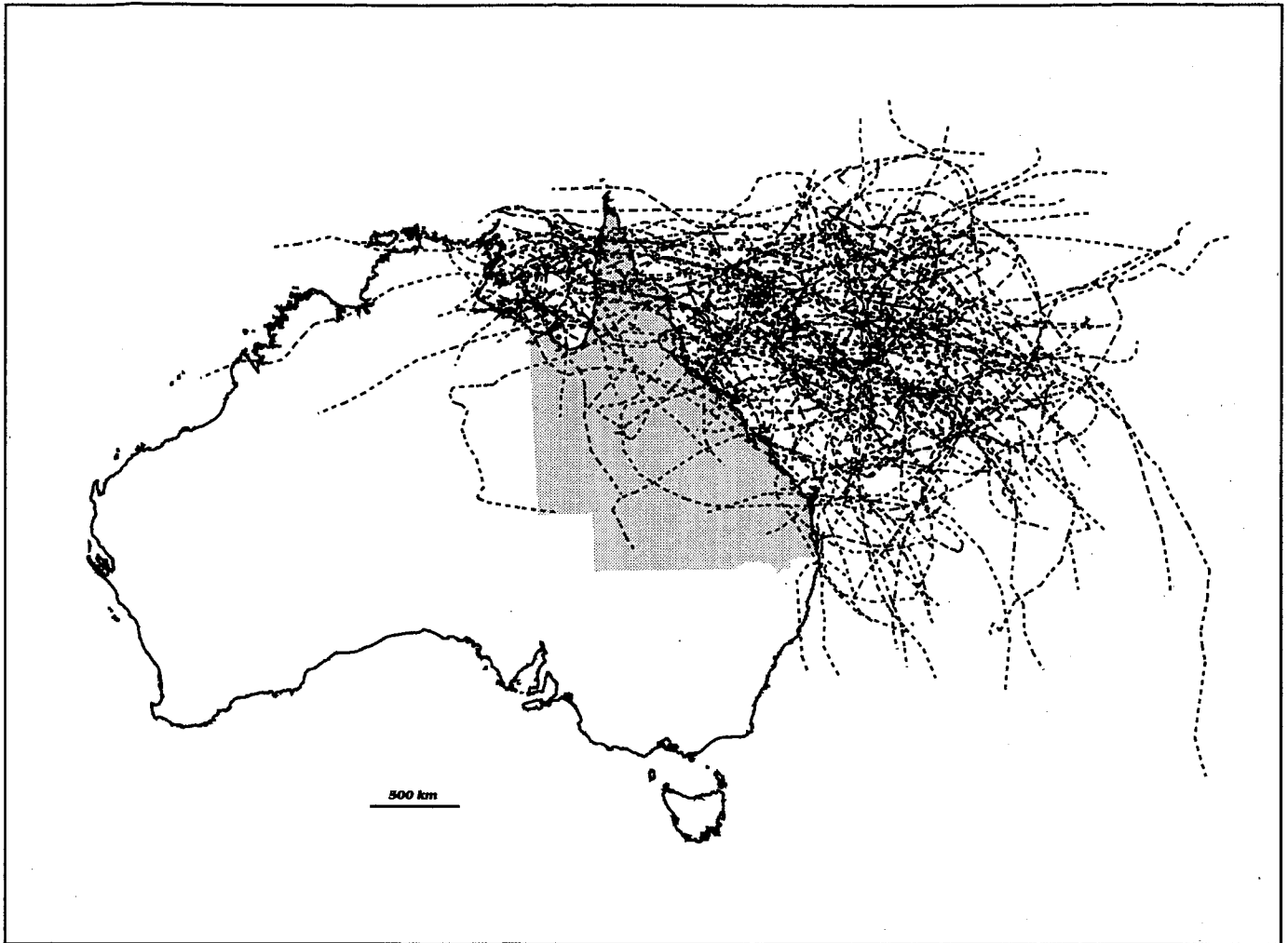
December 1990. Accordingly, December and April cyclones were the most evenly spread across categories, while May was limited to a single category one cyclone.

3.3 REFERENCES

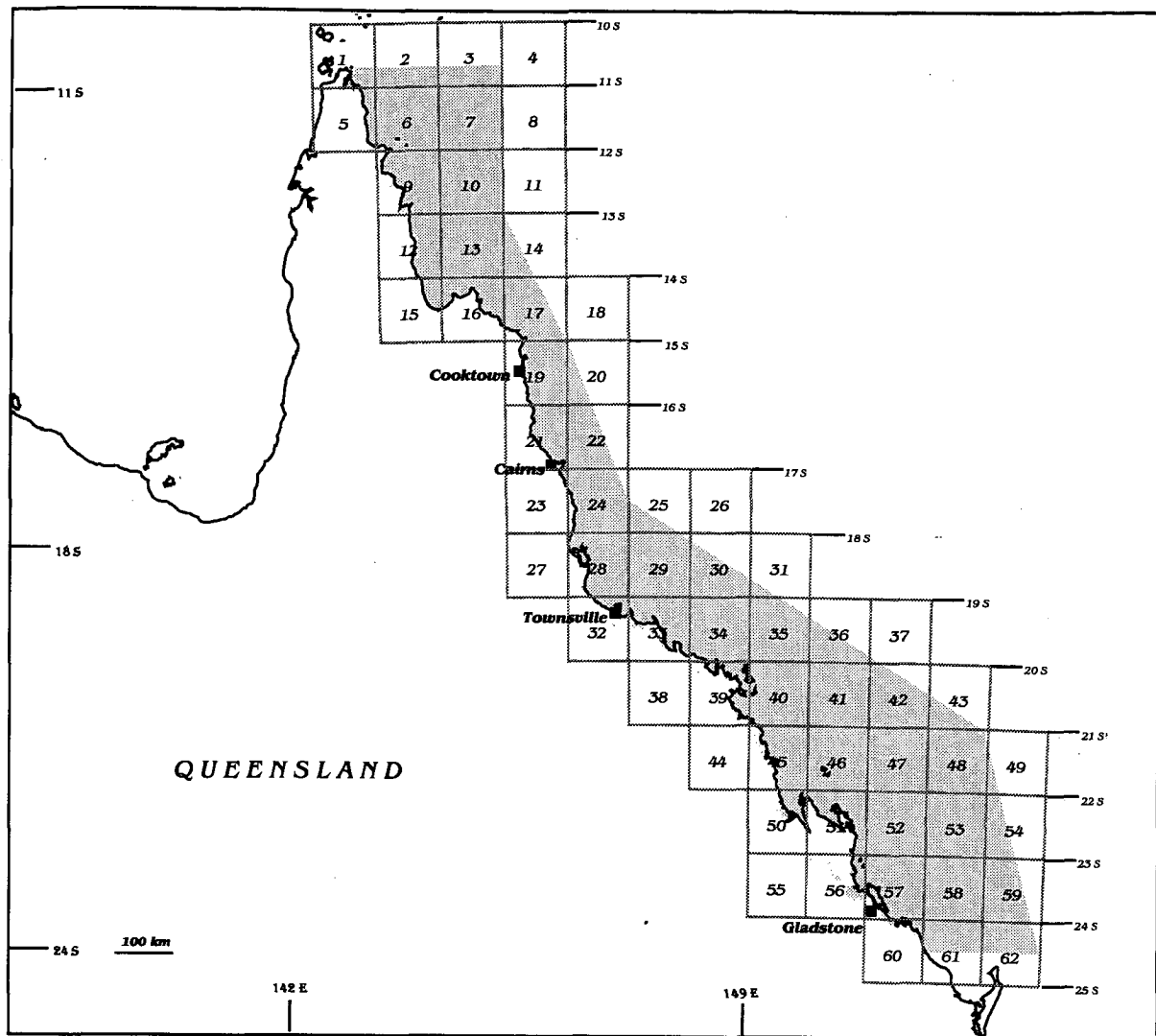
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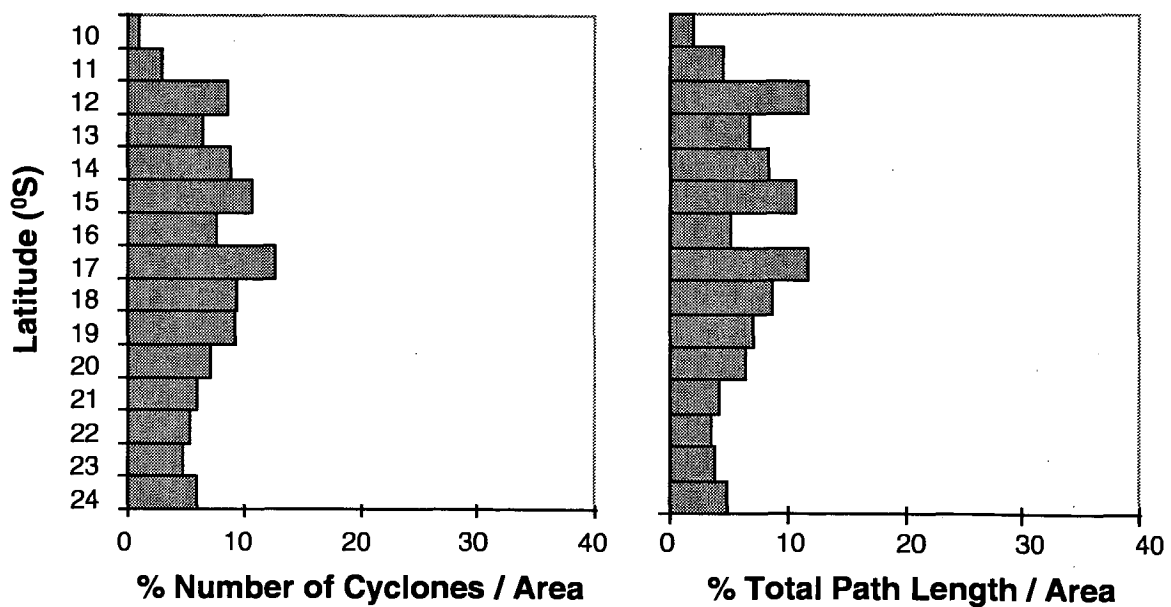
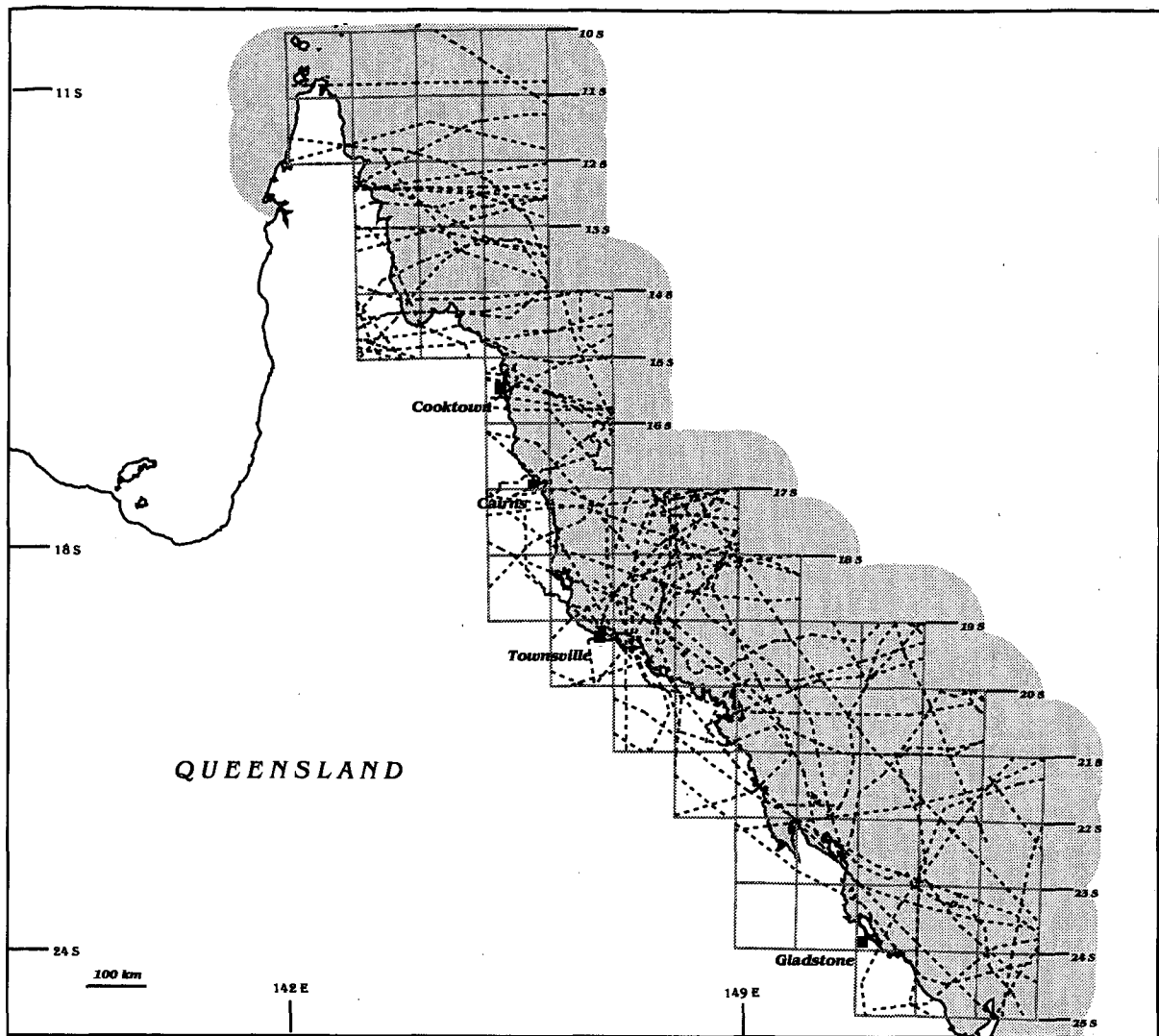


Map 1: *Tropical cyclone paths through Queensland waters, 1969-1997. Dashed lines represent the cyclone paths and the shading identifies Queensland.*

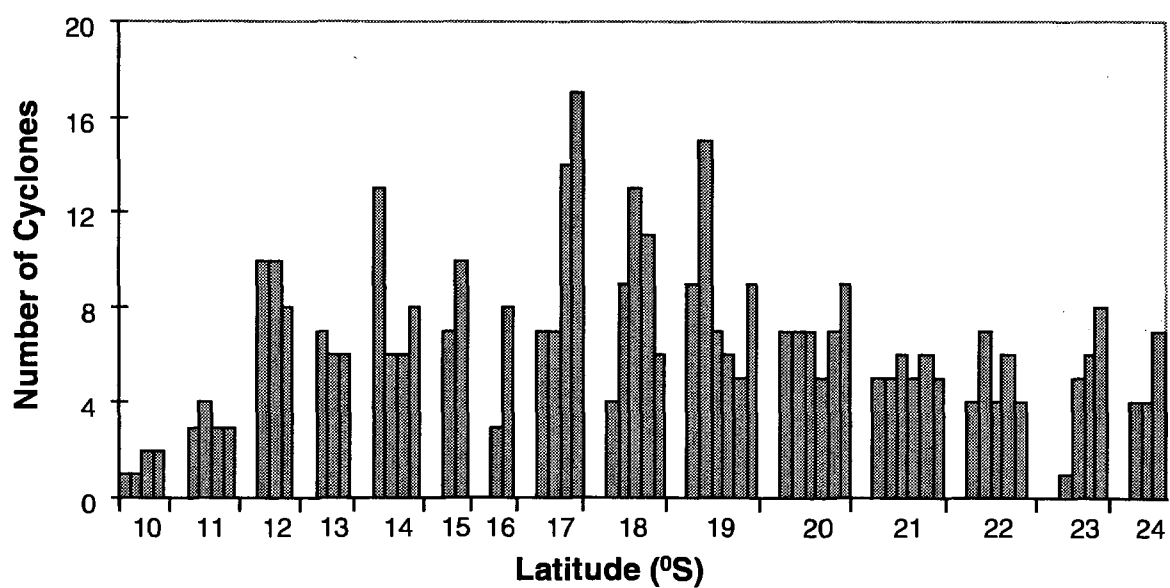
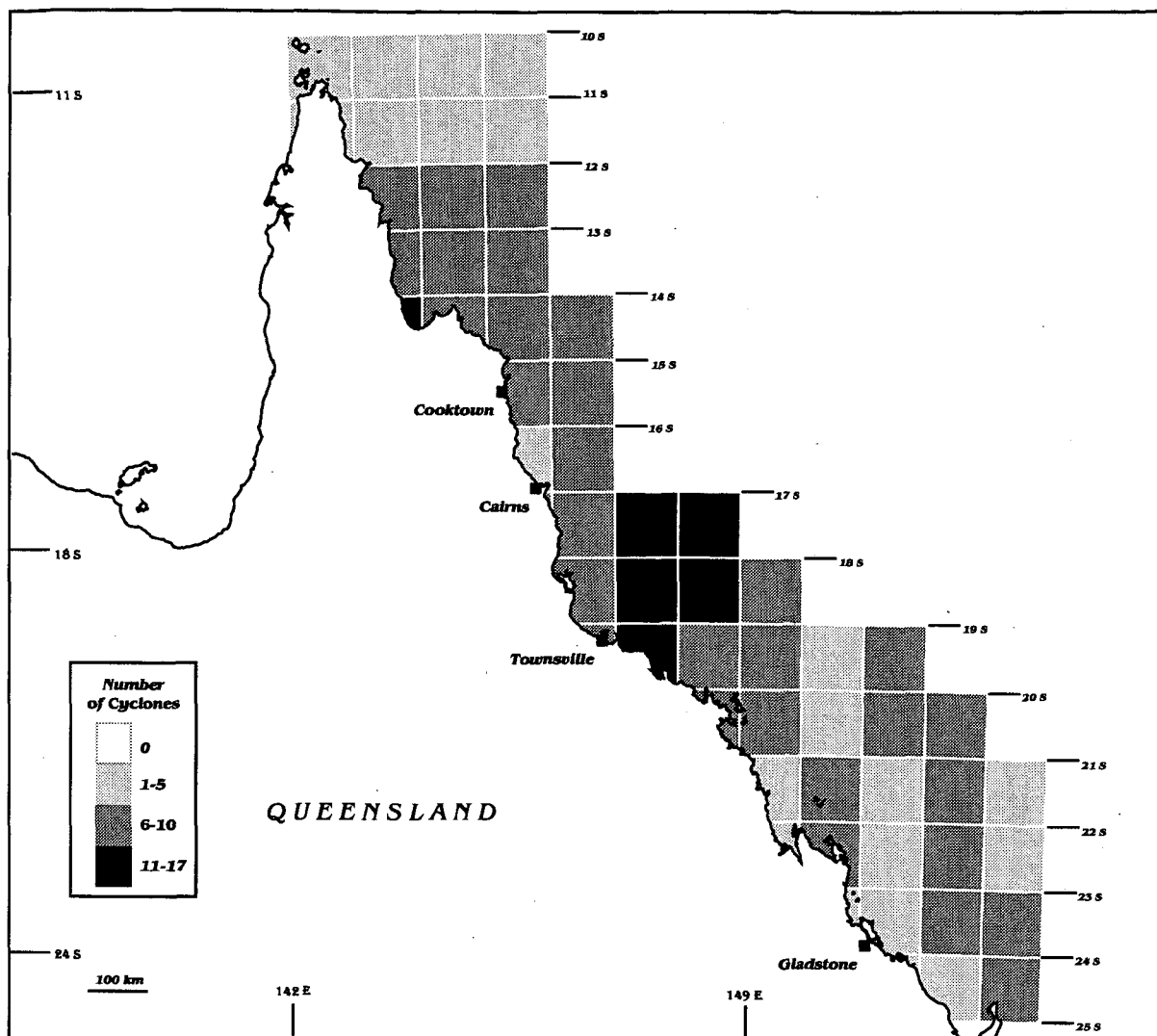


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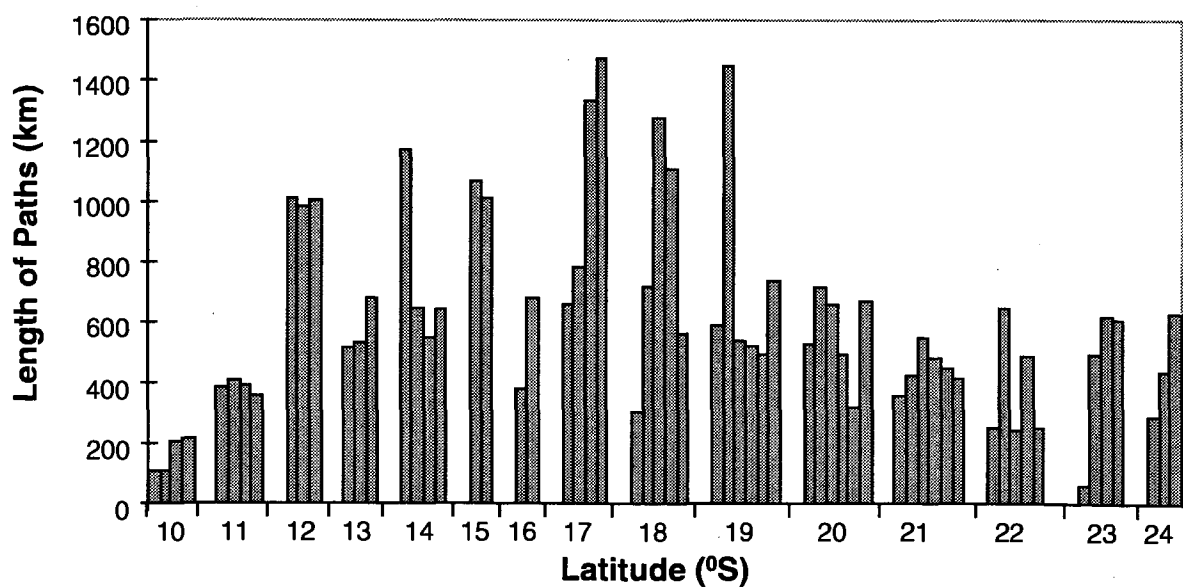
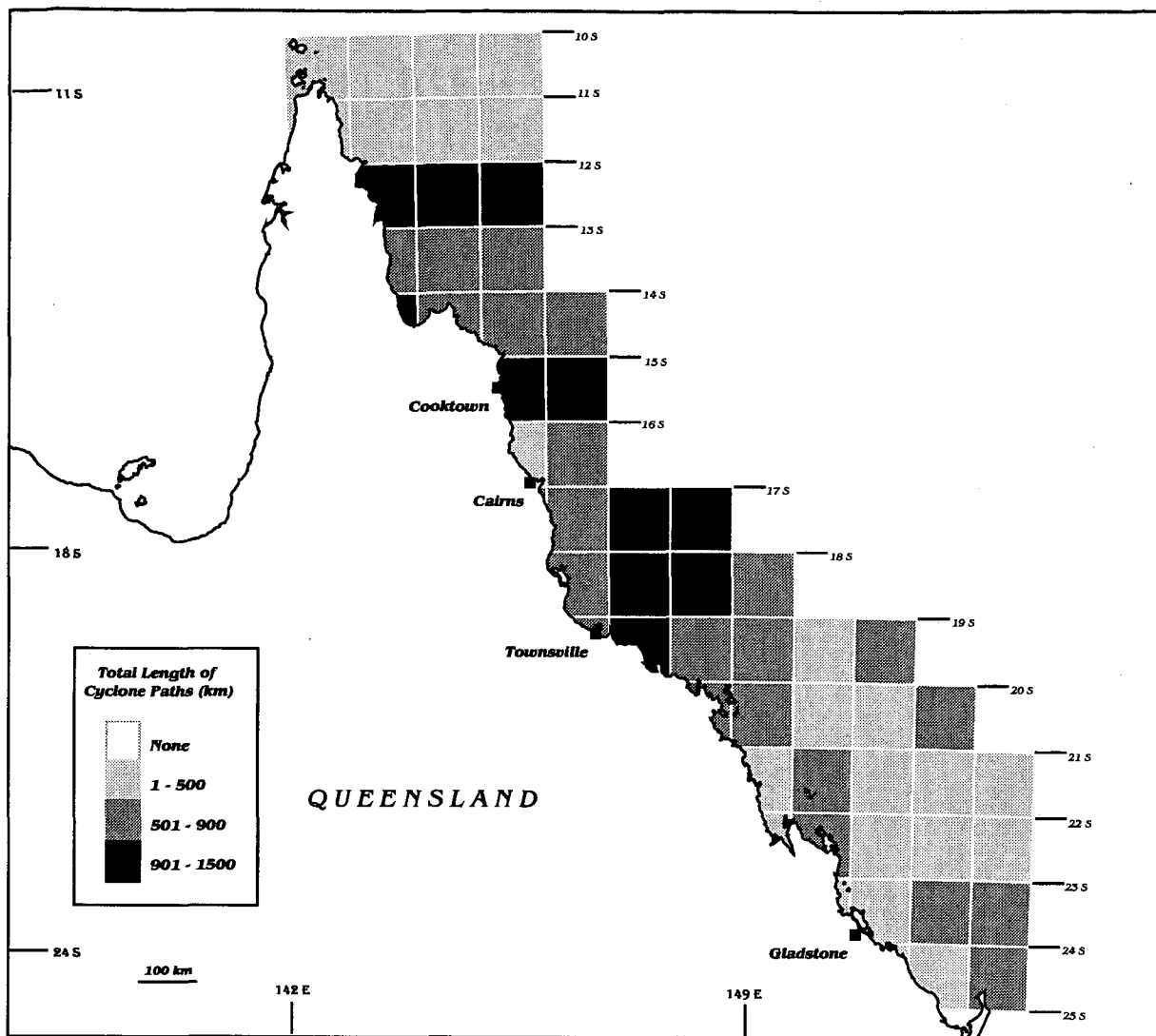
Map 2: *The Great Barrier Reef Region divided into one degree latitude by one degree longitude boxes. The gray shaded area outlines the boundary of the GBR Region.*



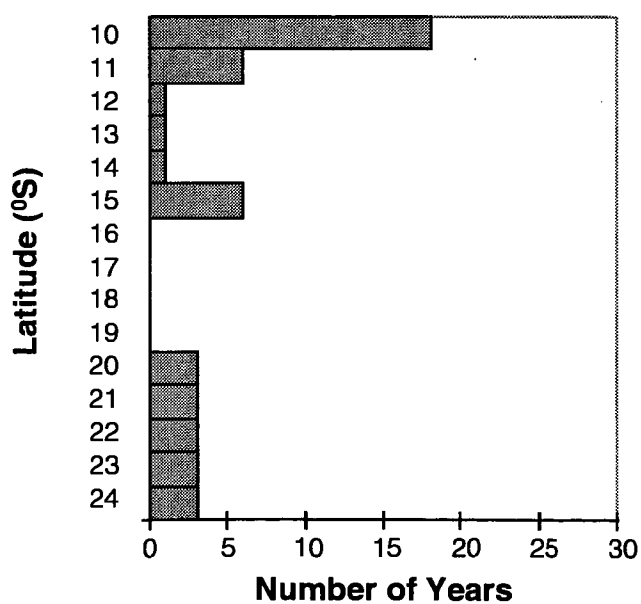
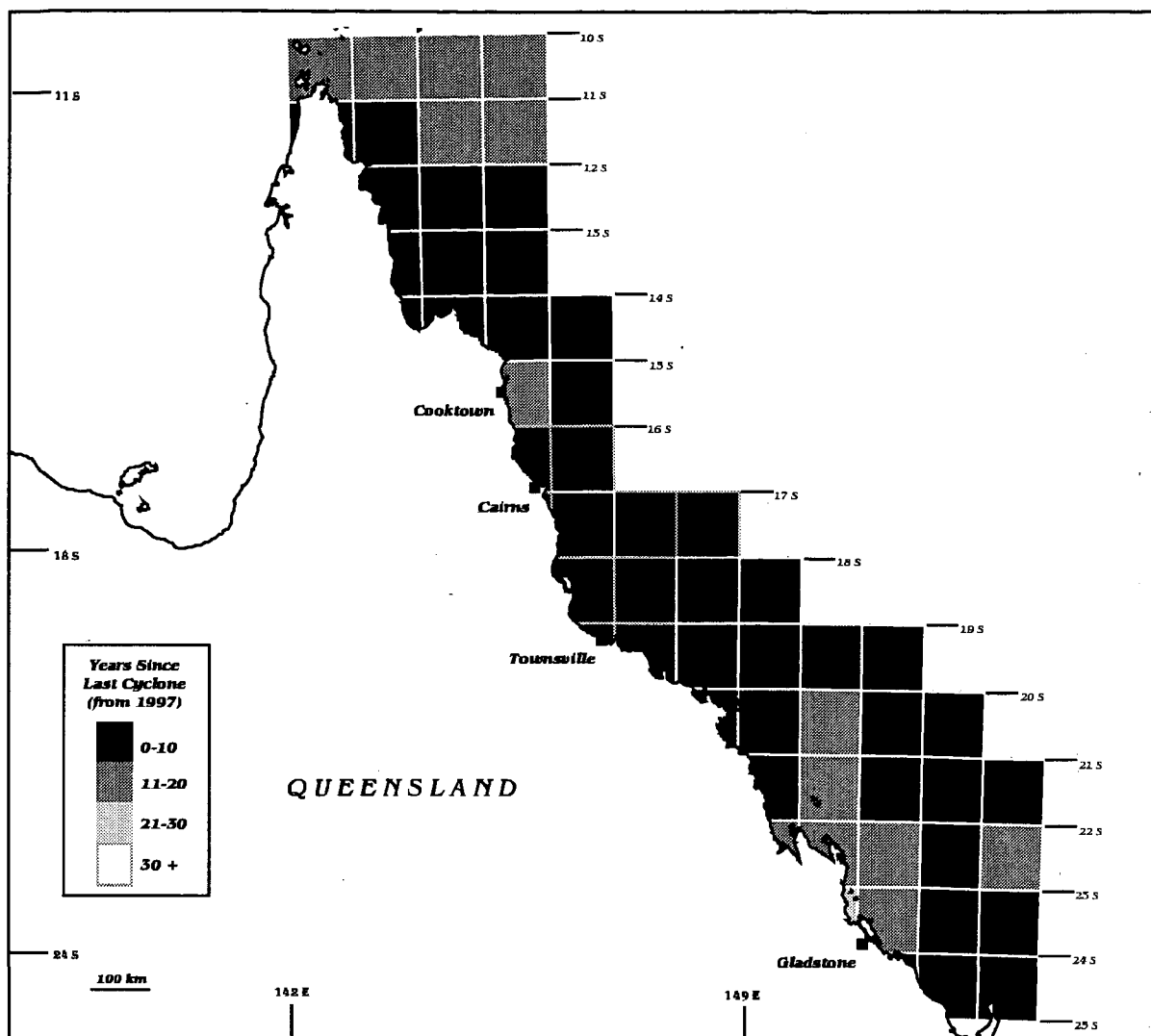
Map 3 : All cyclones 1969-1997. The dashed lines represent cyclone paths and shading indicates areas located within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones by latitude.



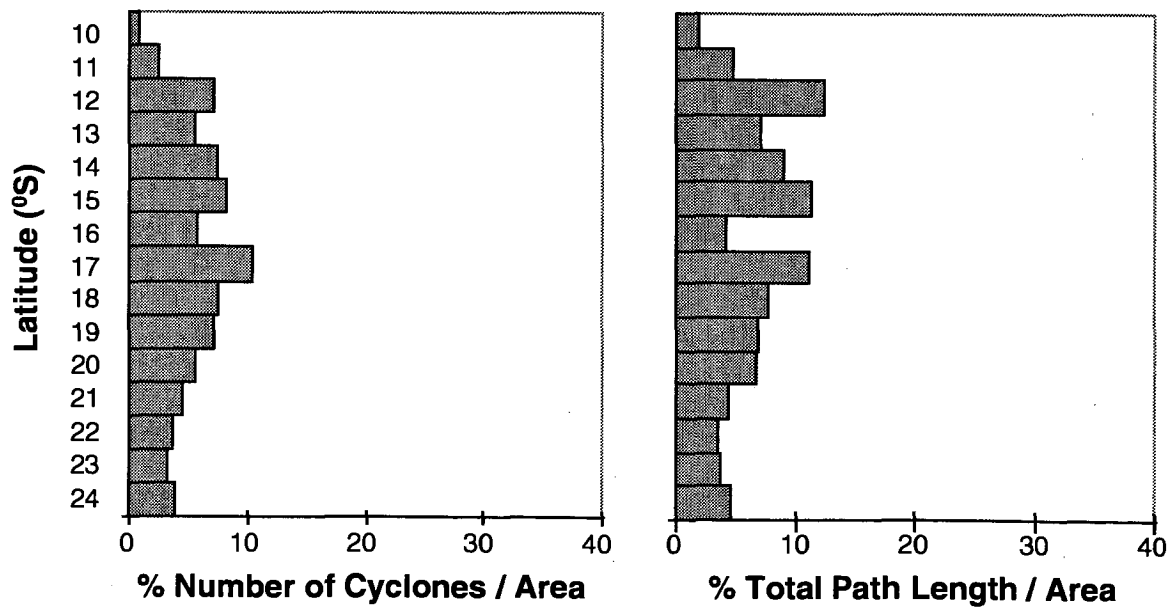
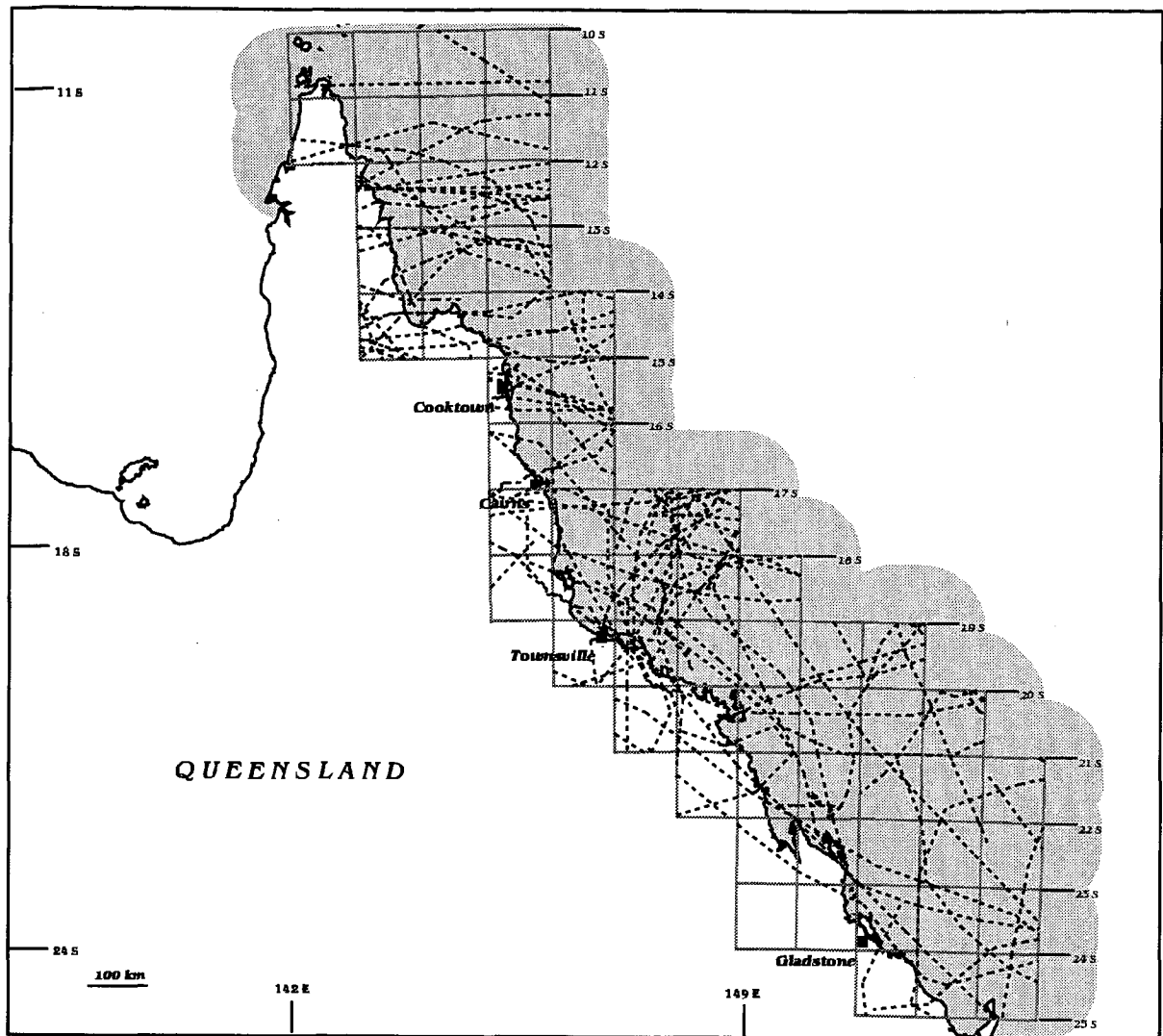
Map 4 : *All cyclones 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



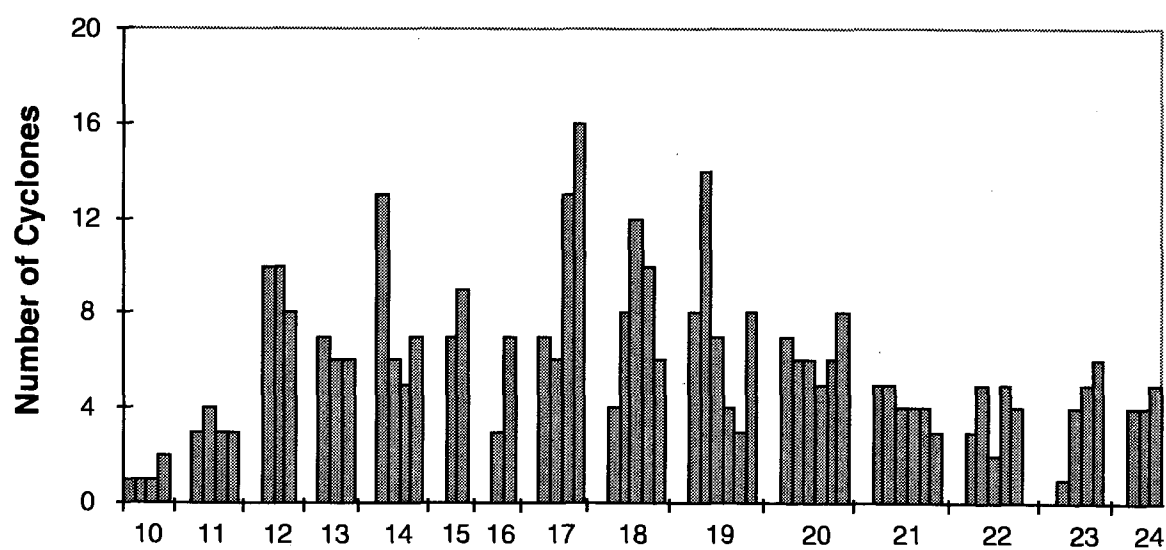
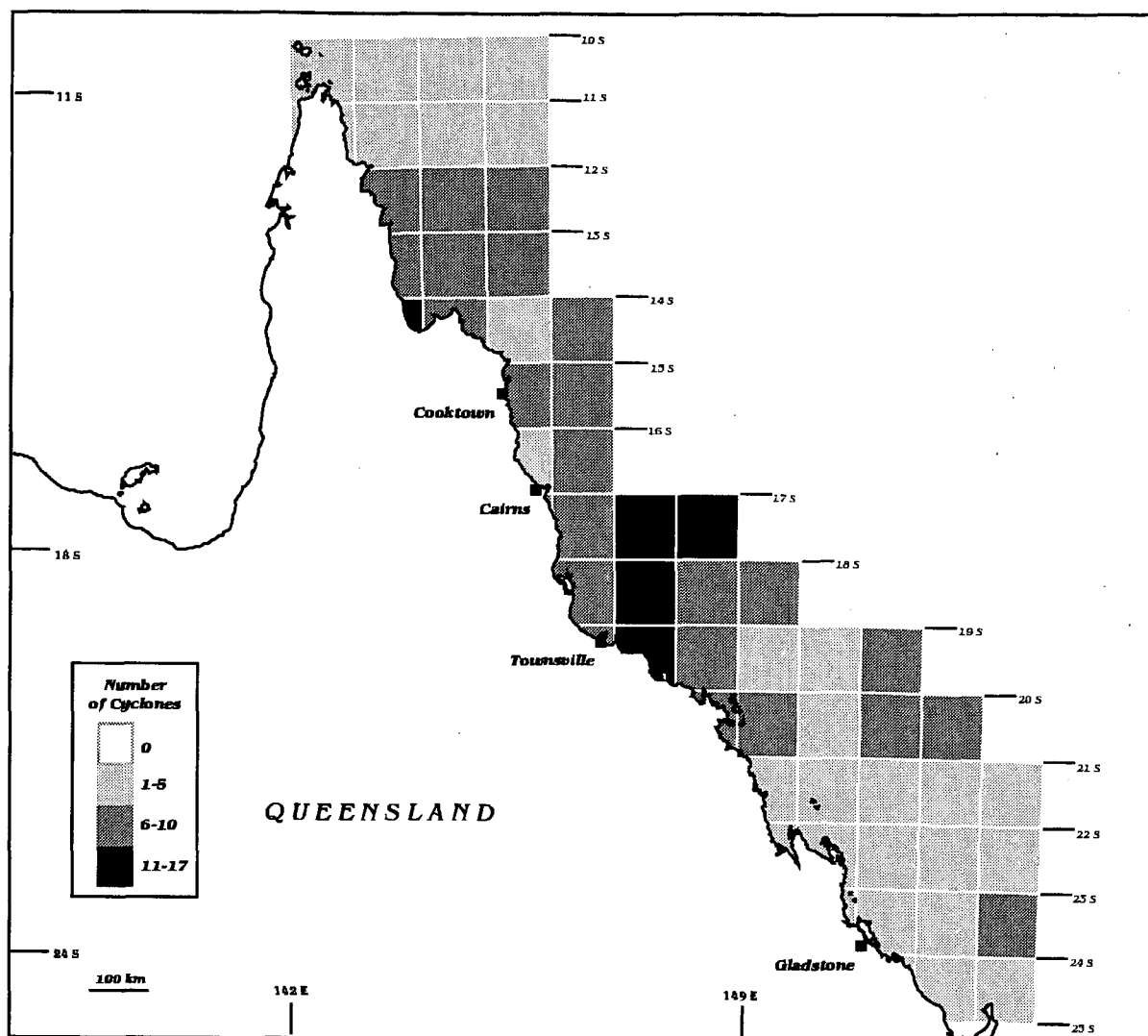
Map 5: *All cyclones 1969-1997: total length of cyclone paths per box. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



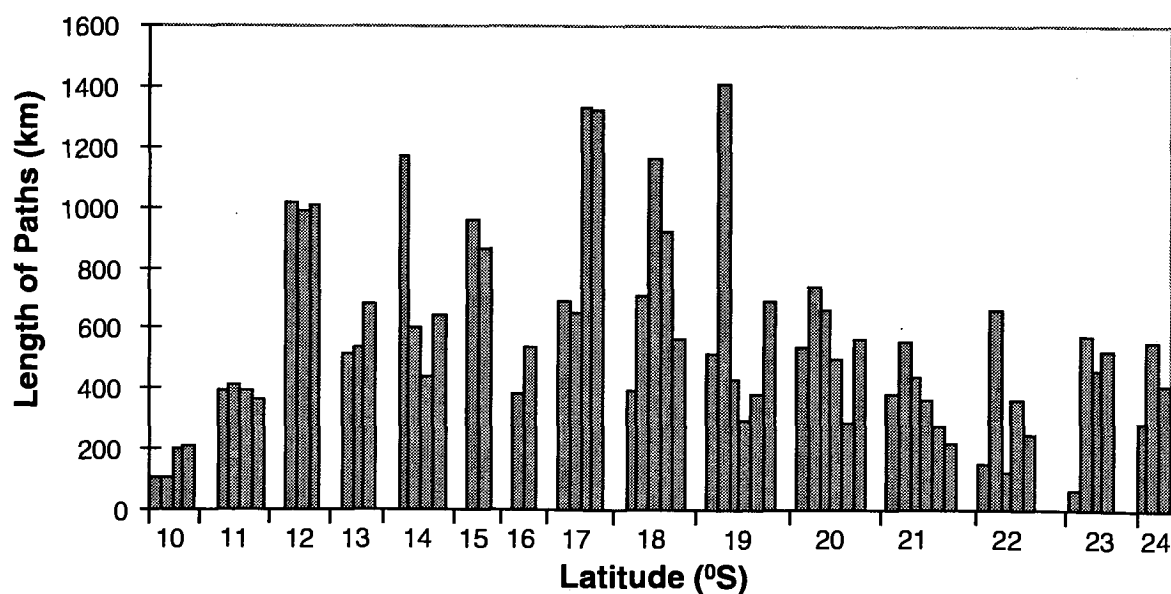
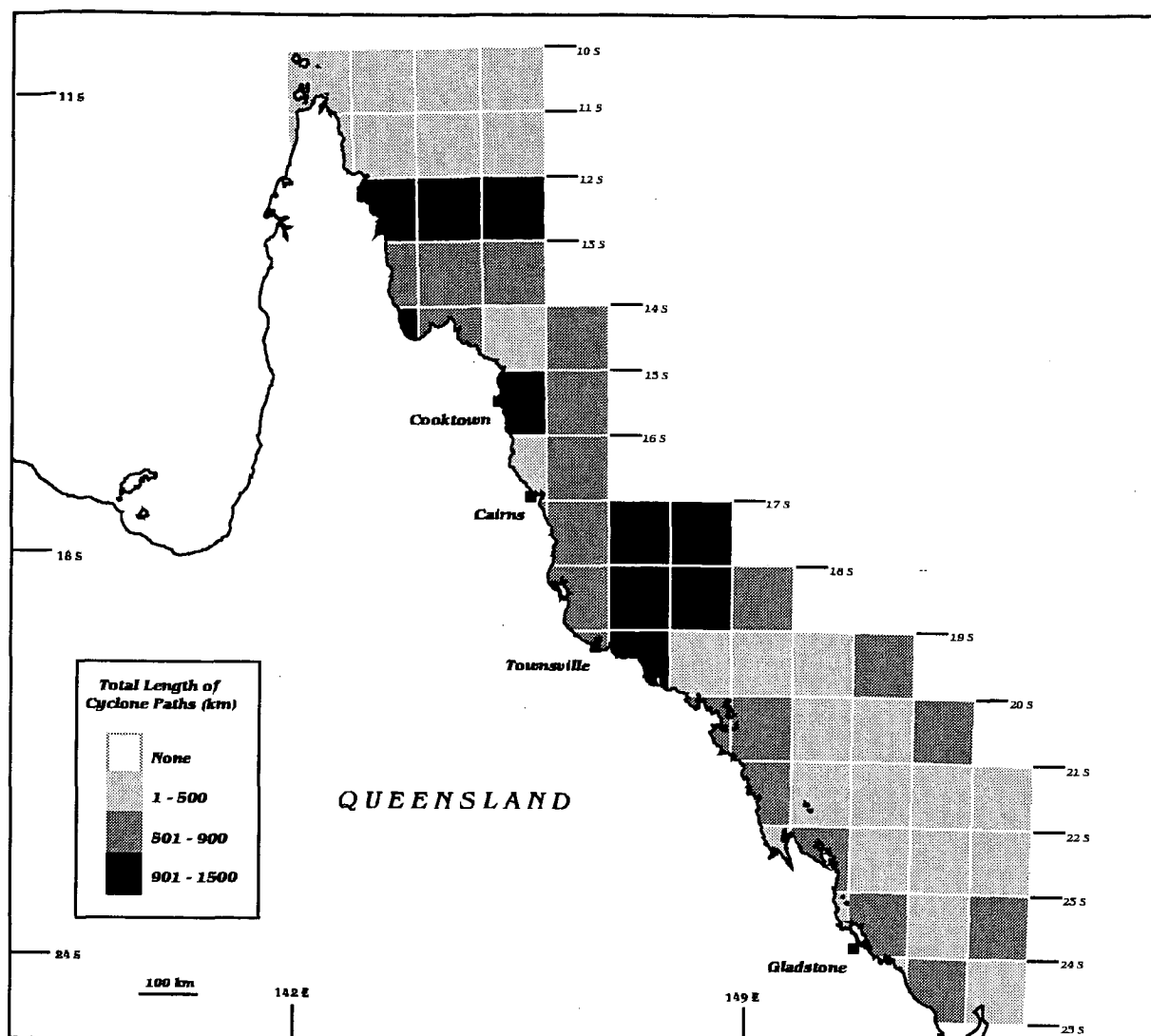
Map 6 : *Number of years before 1997 since the last cyclone. Boxes classified as 30+ years have had no cyclones pass through them from 1969 to 1997.*



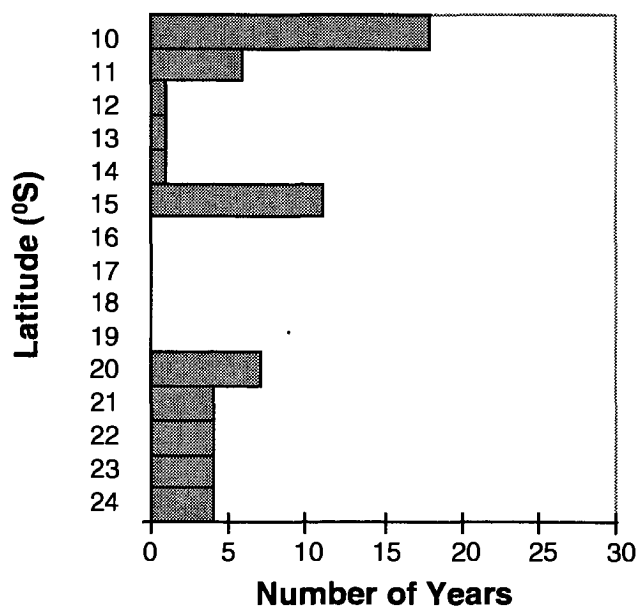
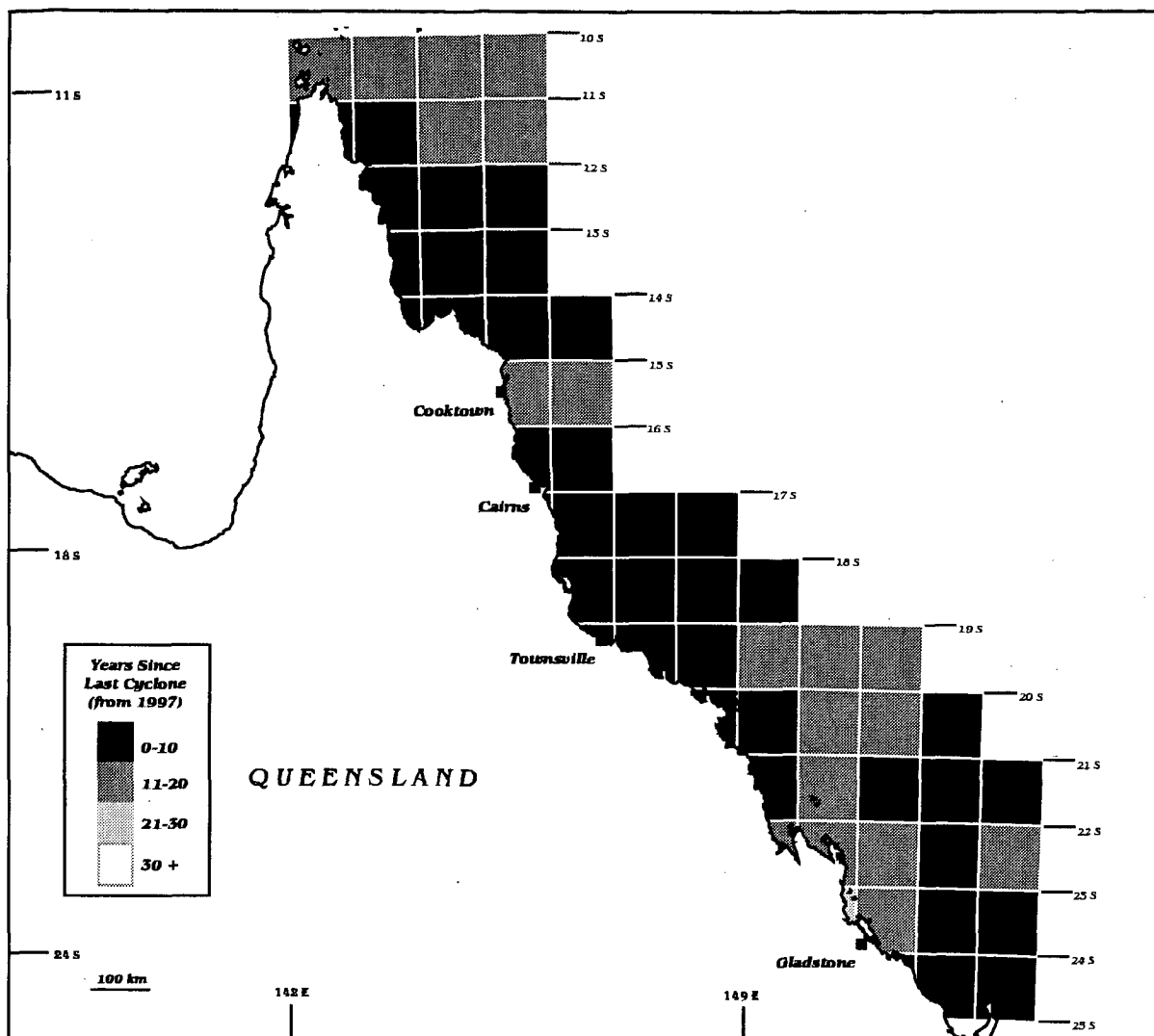
Map 7 : *All weak (categories 0-2) cyclones 1969-1997. The dashed lines represent cyclone paths and shading indicates areas located within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all weak cyclones by latitude.*



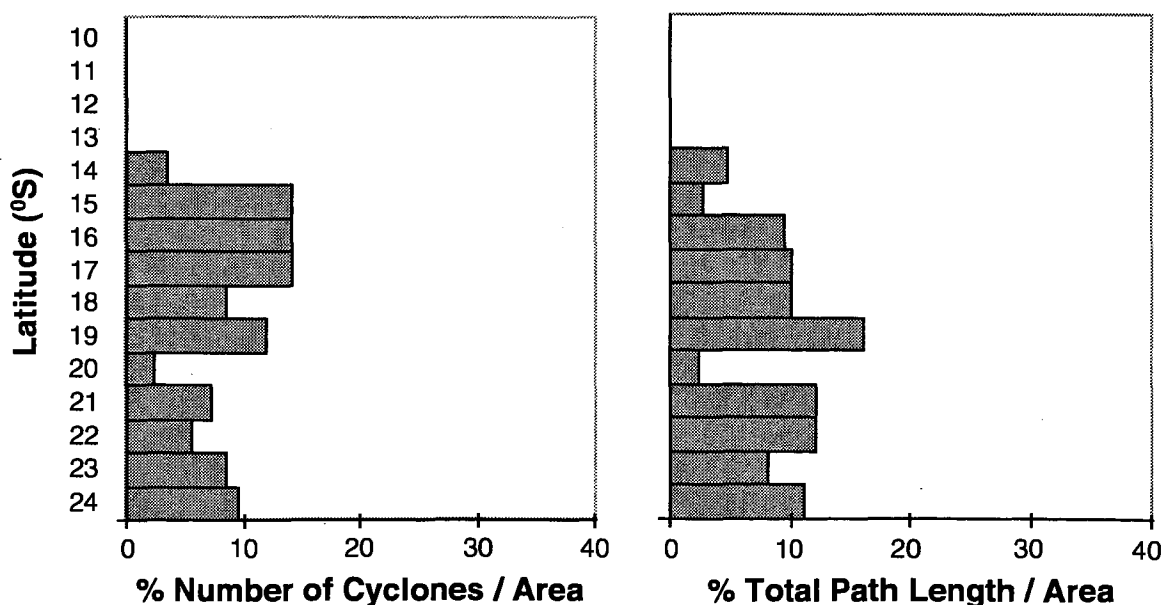
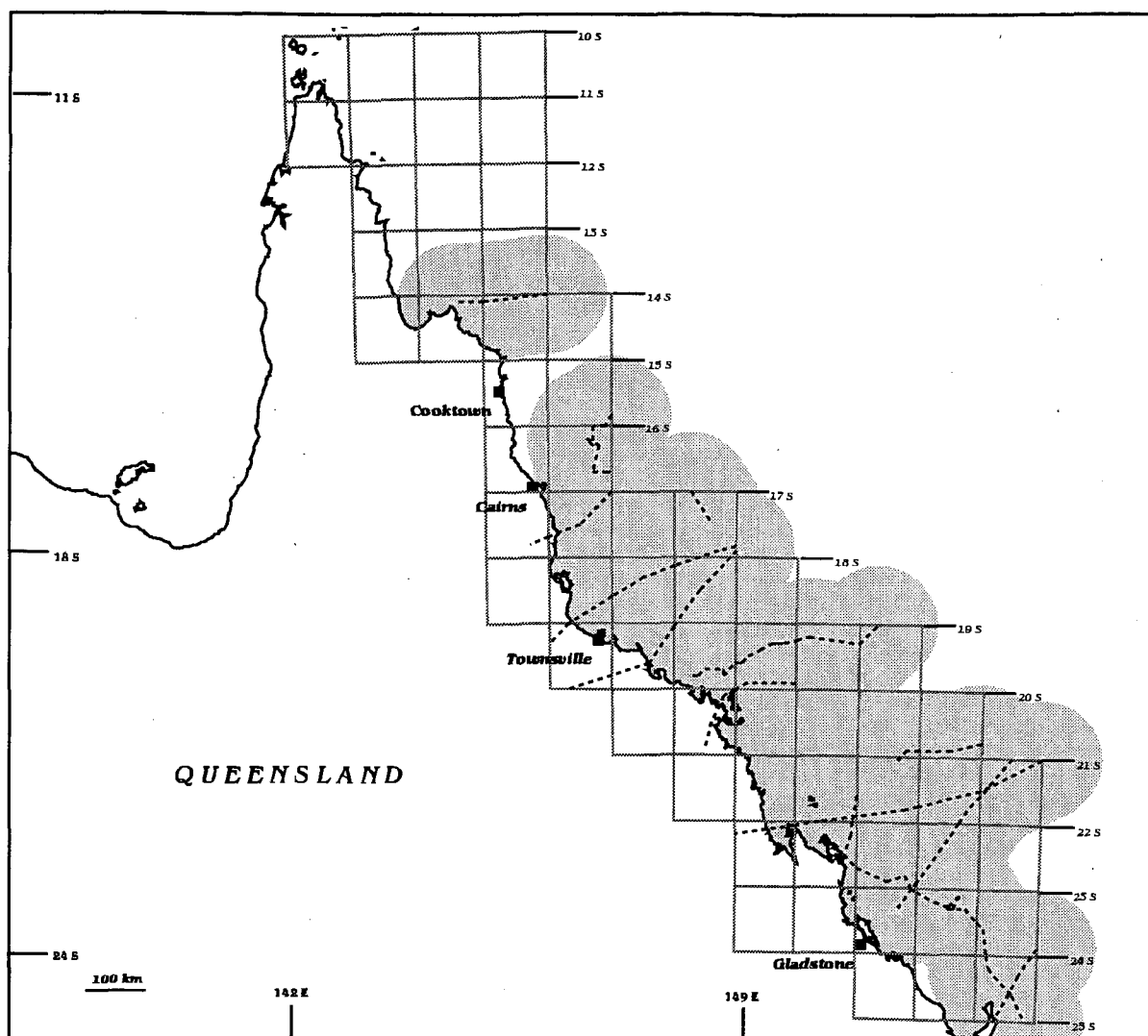
Map 8 : All weak (categories 0-2) cyclones 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.



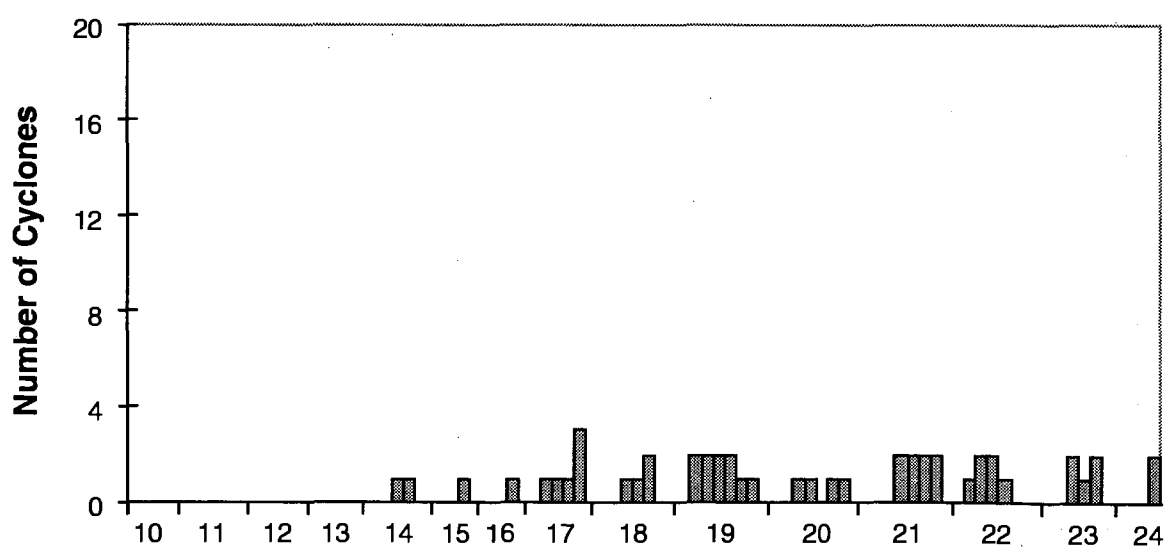
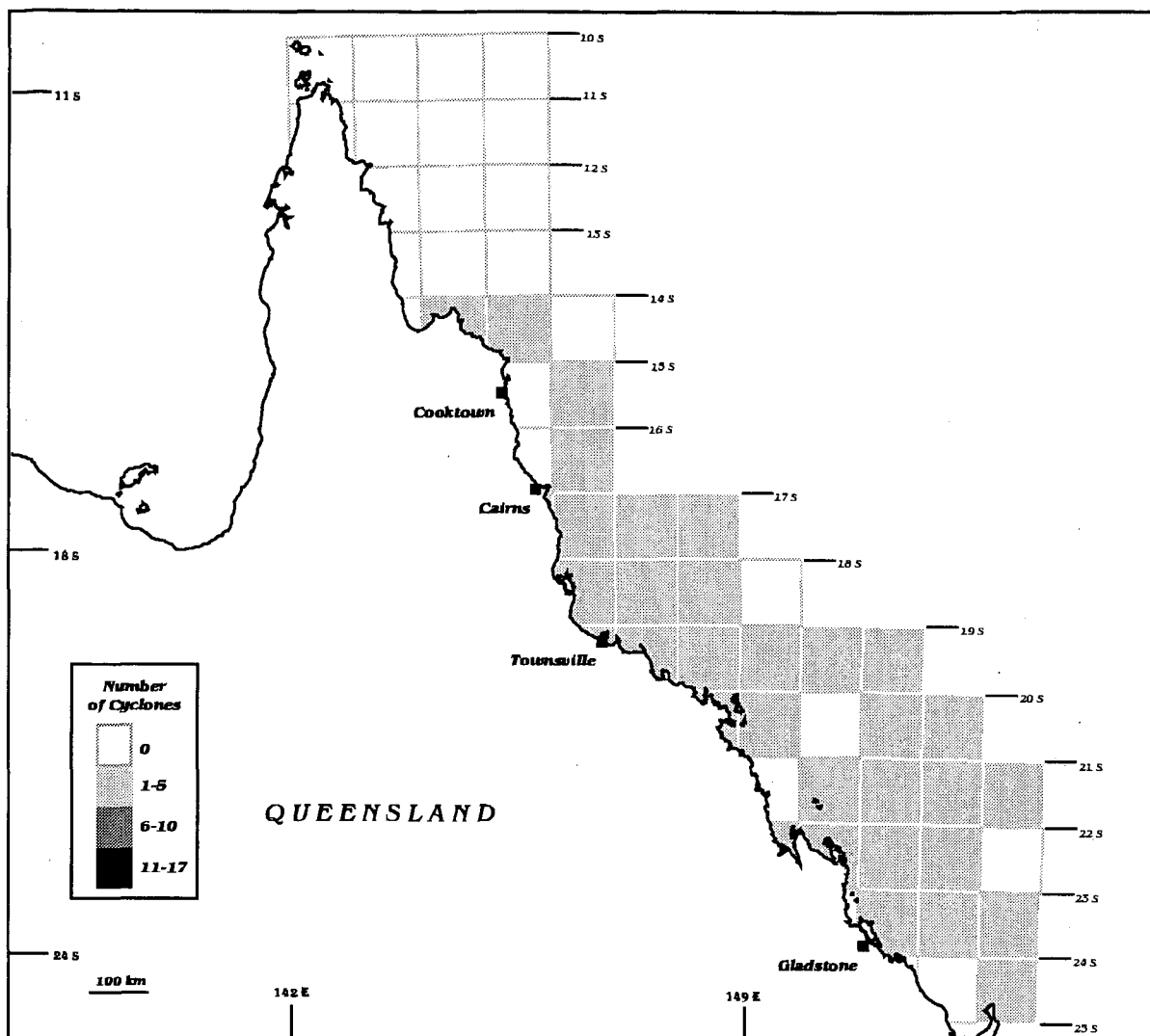
Map 9: *All weak (categories 0-2) cyclones 1969-1997: total length of cyclone paths. Separate bars within each latitude depict the values for each 1° latitude by 1° longitude box.*



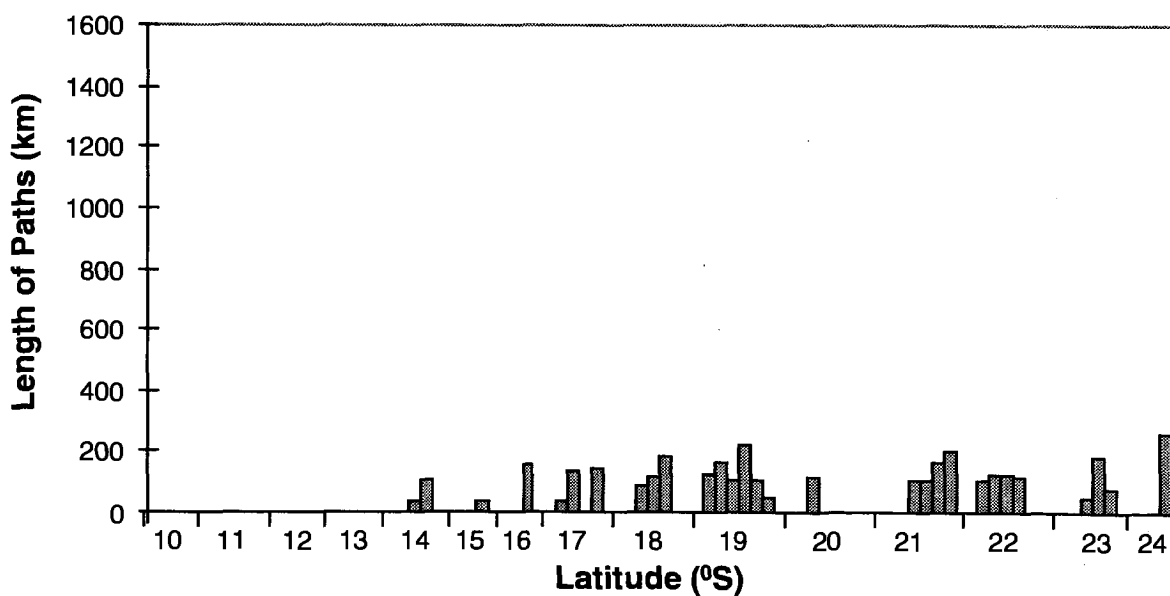
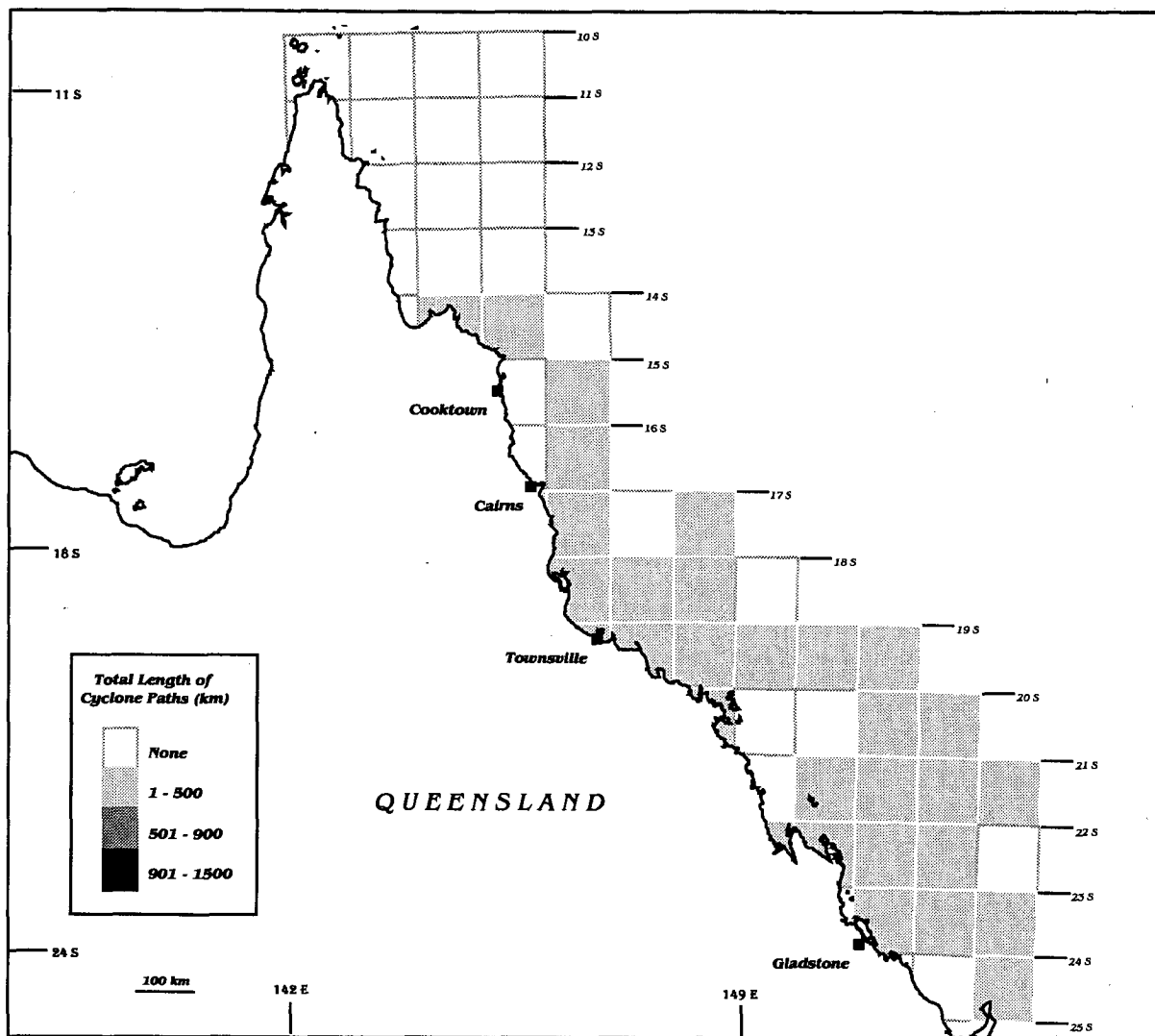
Map 10: *Number of years before 1997 since the last weak (category 0-2) cyclone. Boxes classified as 30+ years have had no weak cyclones pass through them from 1969 to 1997.*



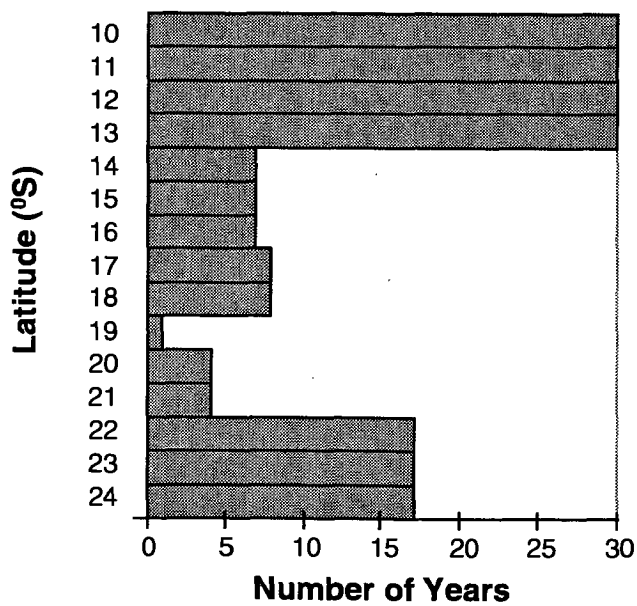
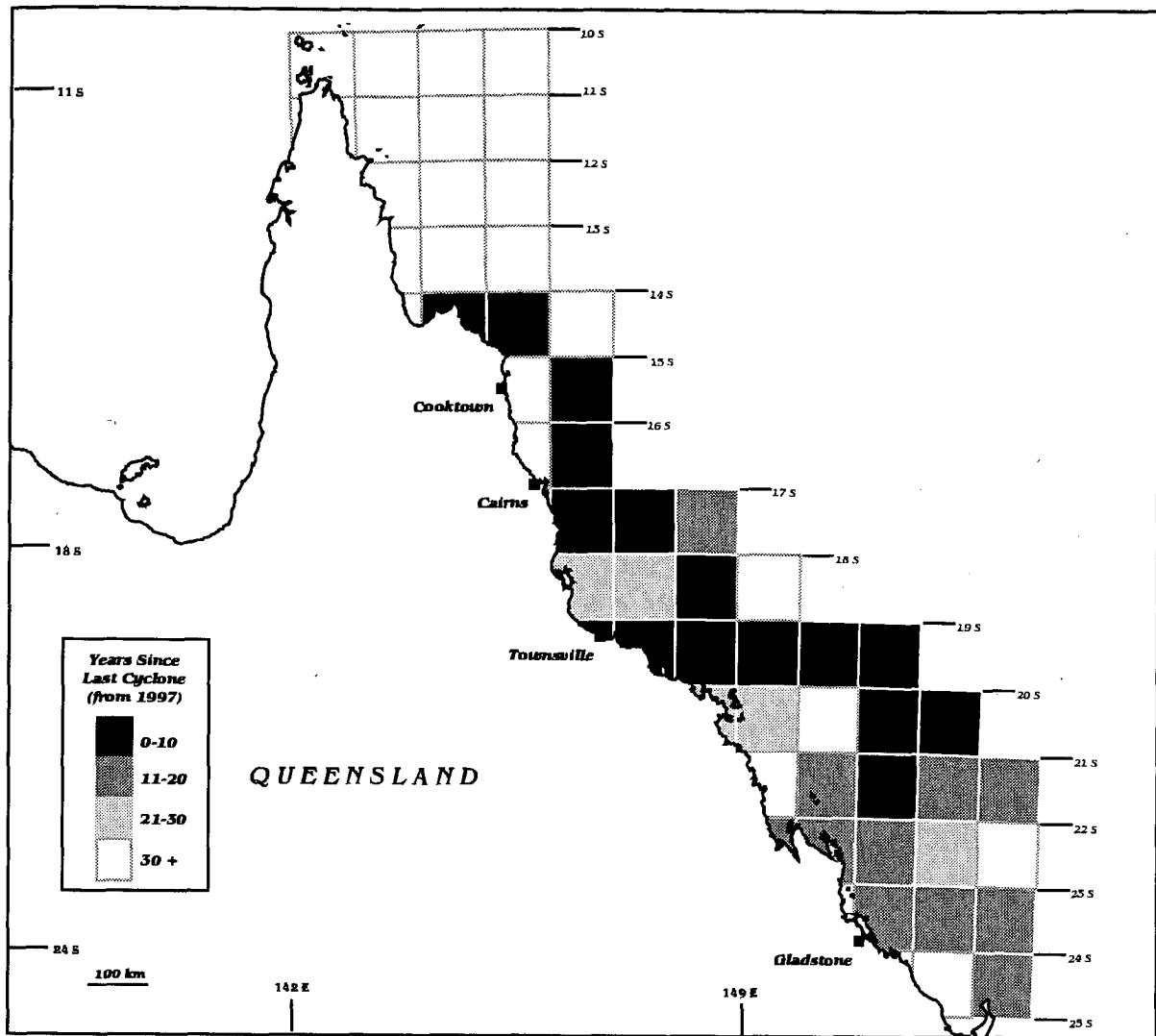
Map 11 : All strong (categories 3-5) cyclones 1969-1997. The dashed lines represent cyclone paths and shading indicates areas located within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all strong cyclones by latitude.



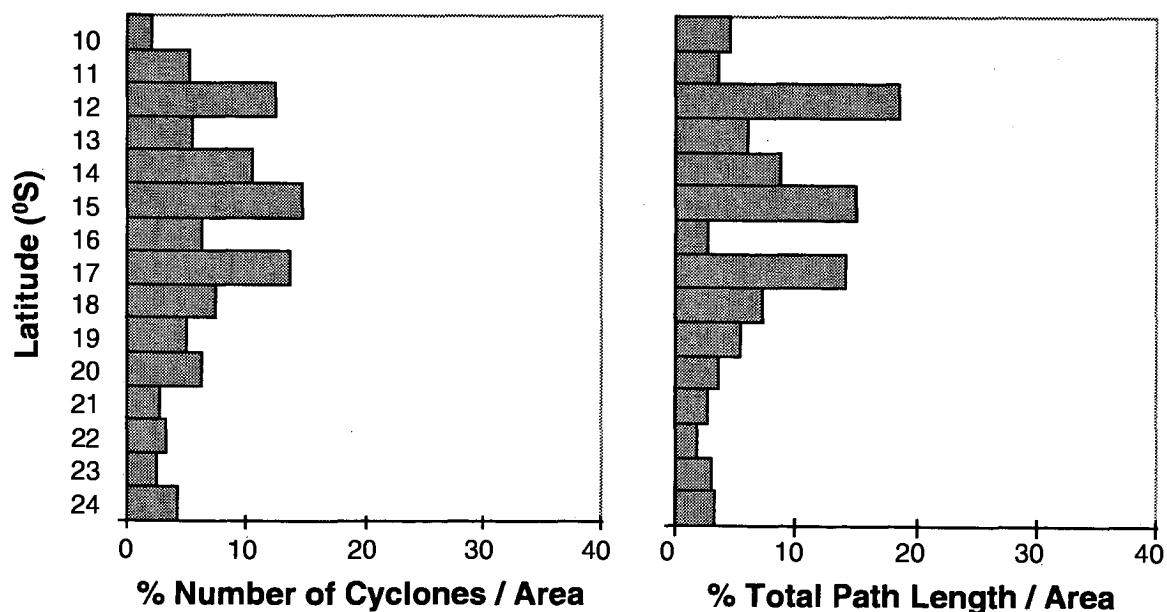
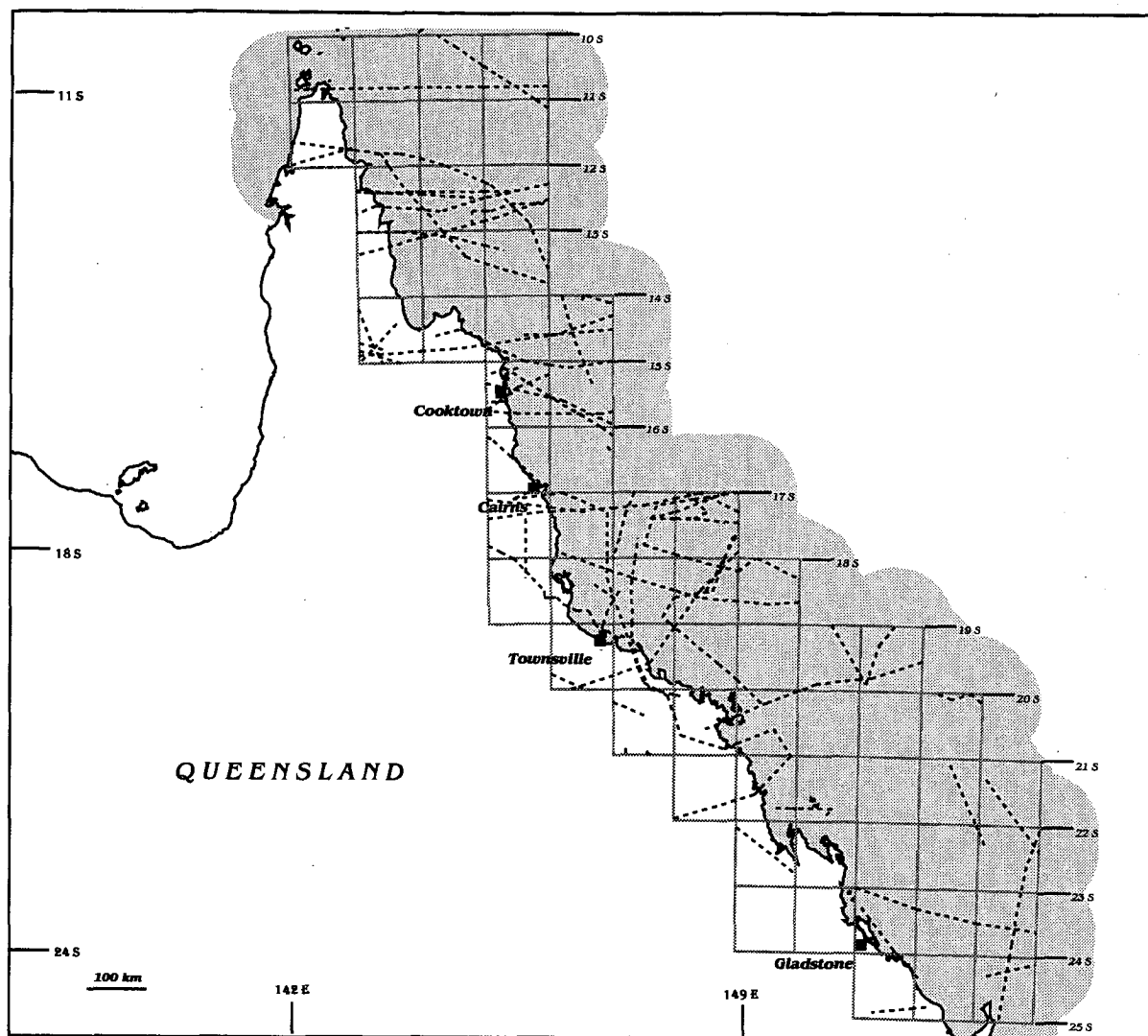
Map 12: All strong (categories 3-5) cyclones 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.



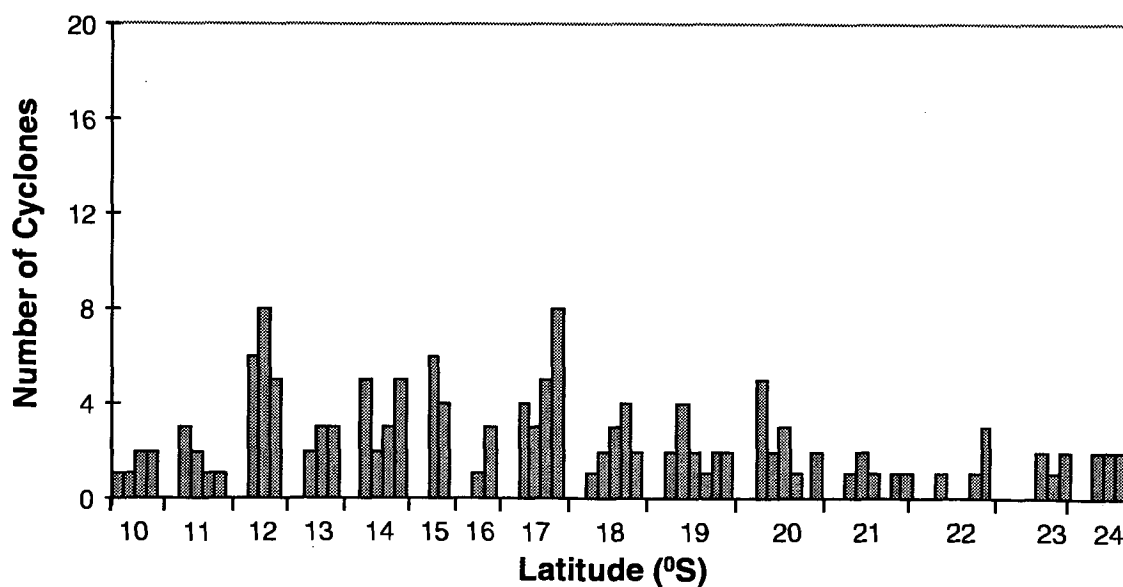
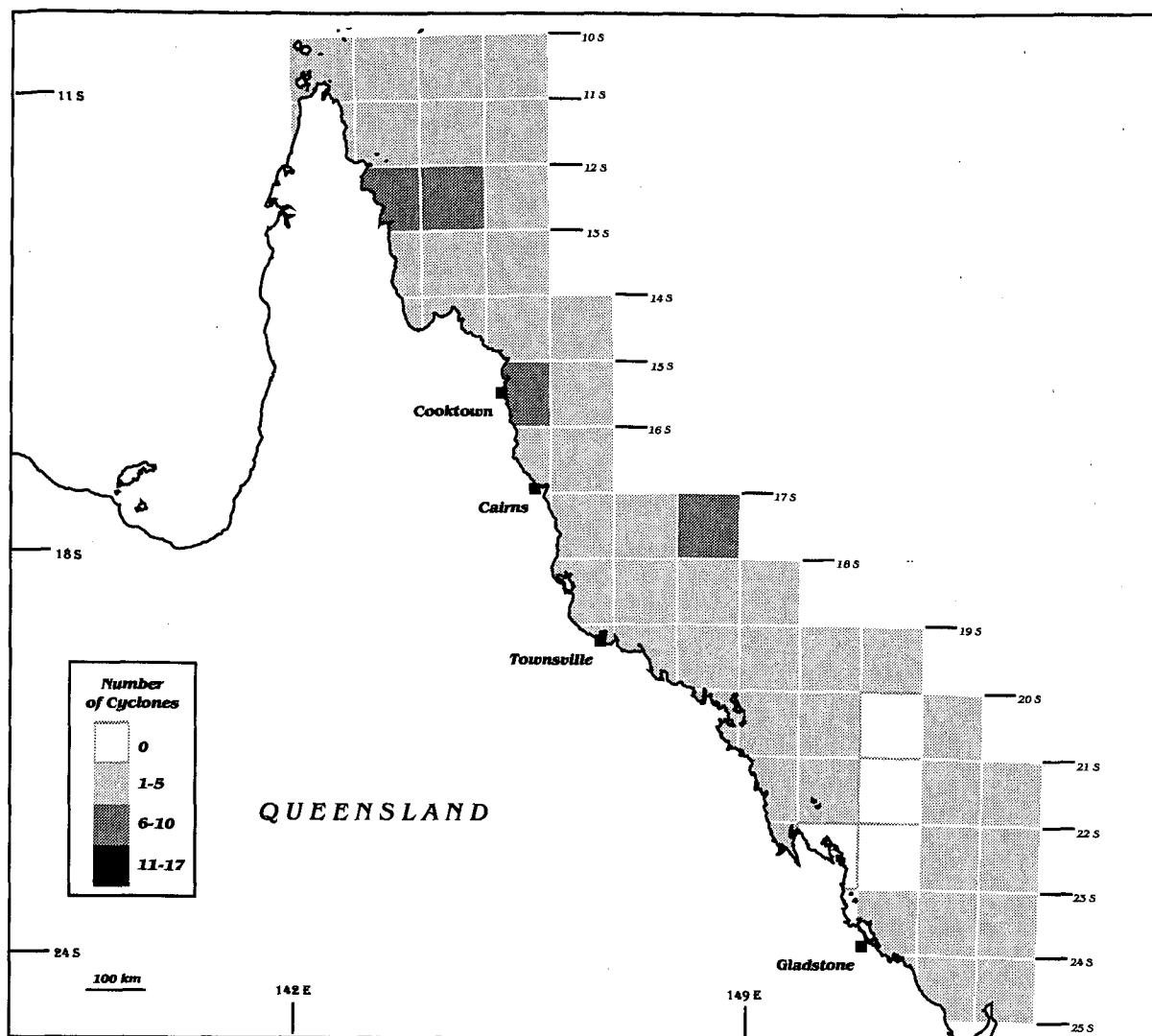
Map 13: *All strong (categories 3-5) cyclones 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



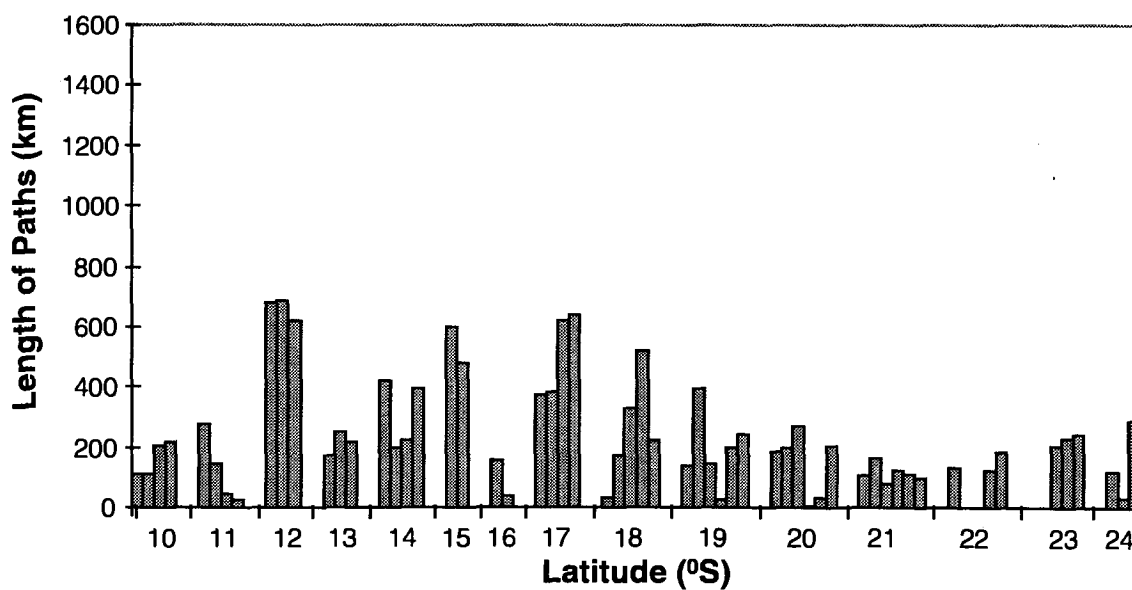
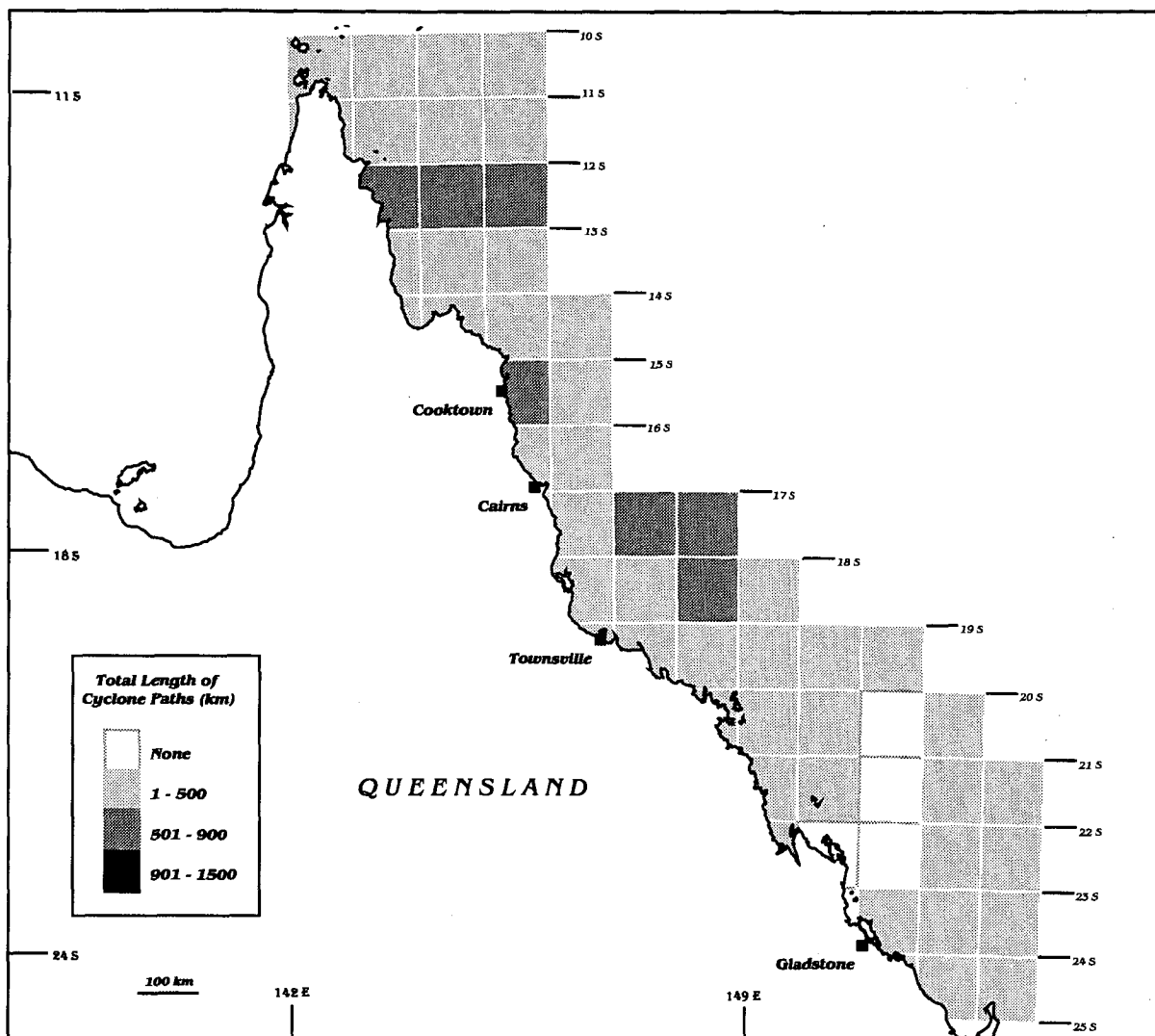
Map 14 : *Number of years before 1997 since the last strong (categories 3-5) cyclone.*
Boxes classified as 30+ years have had no strong cyclones pass through them from 1969 to 1997.



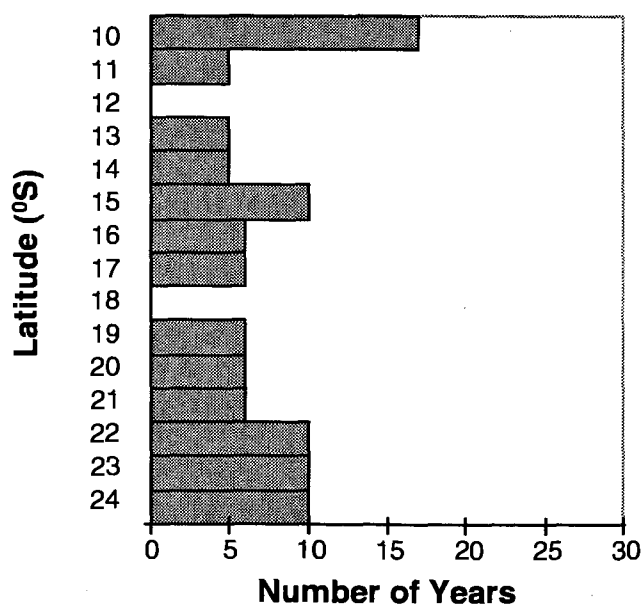
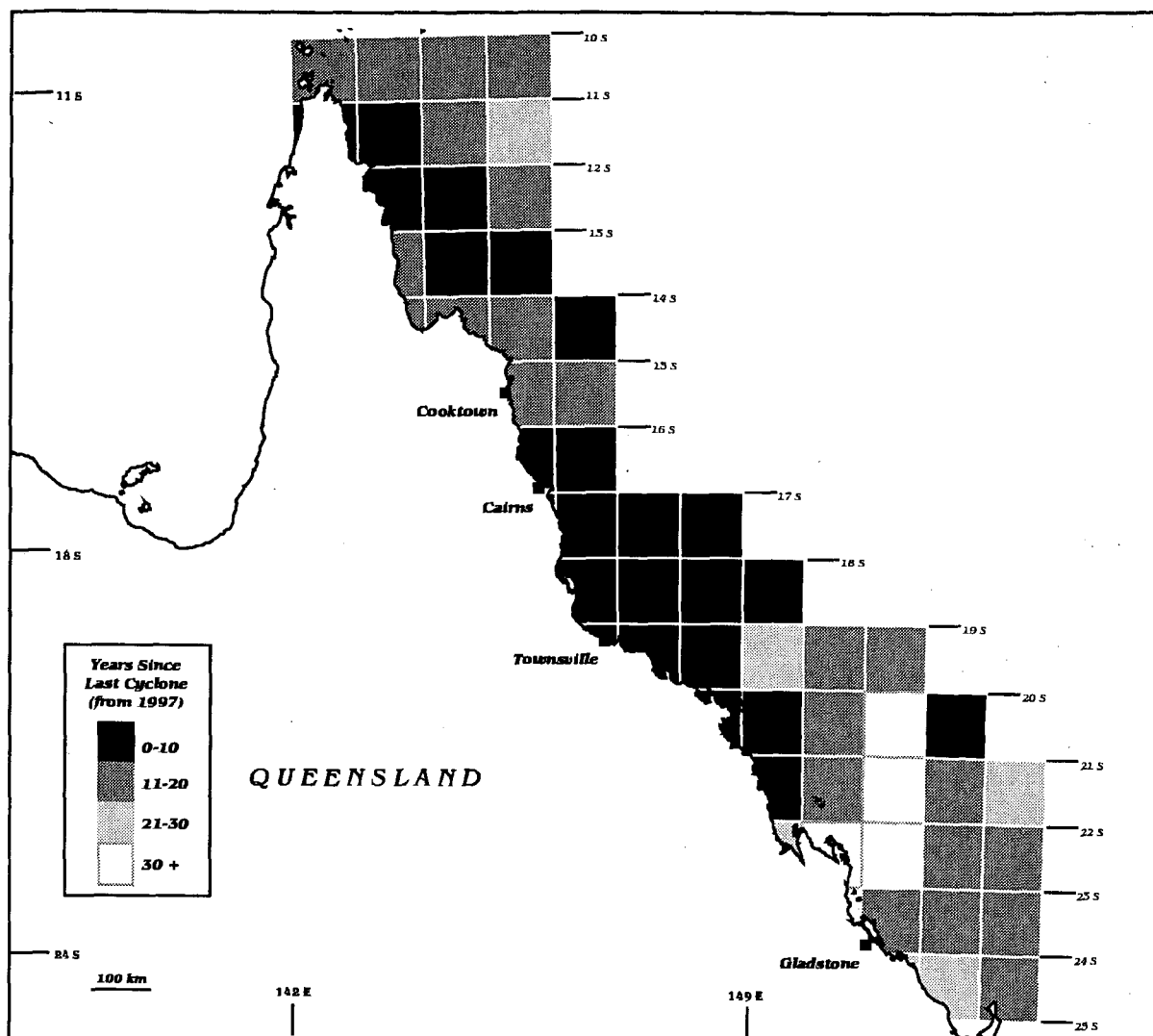
Map 15: Category 0 cyclones 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of category 0 cyclones by latitude.



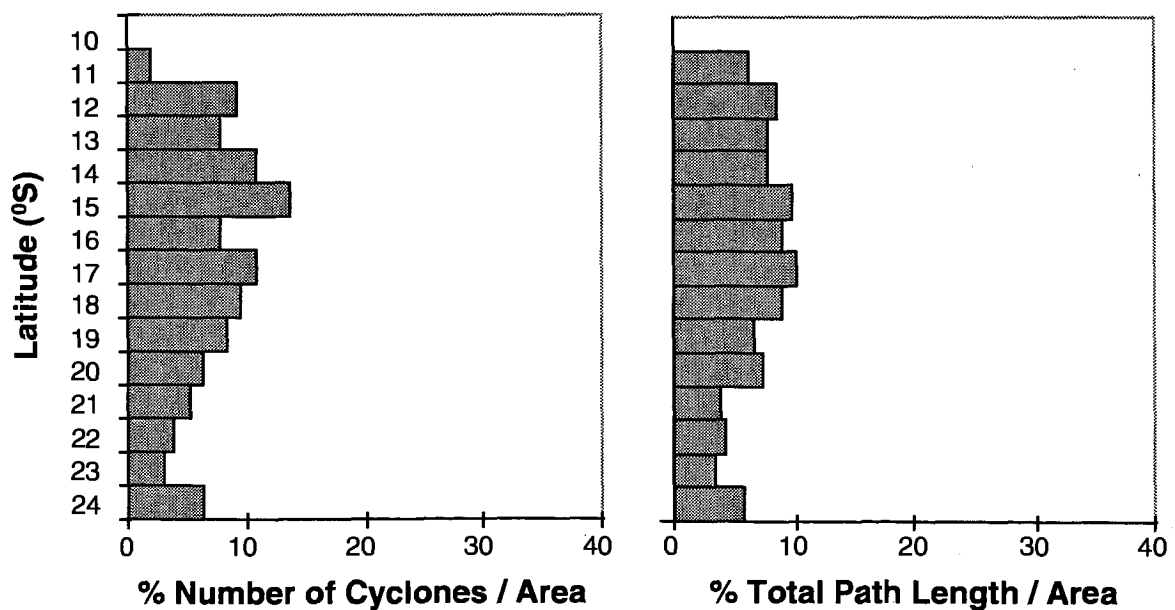
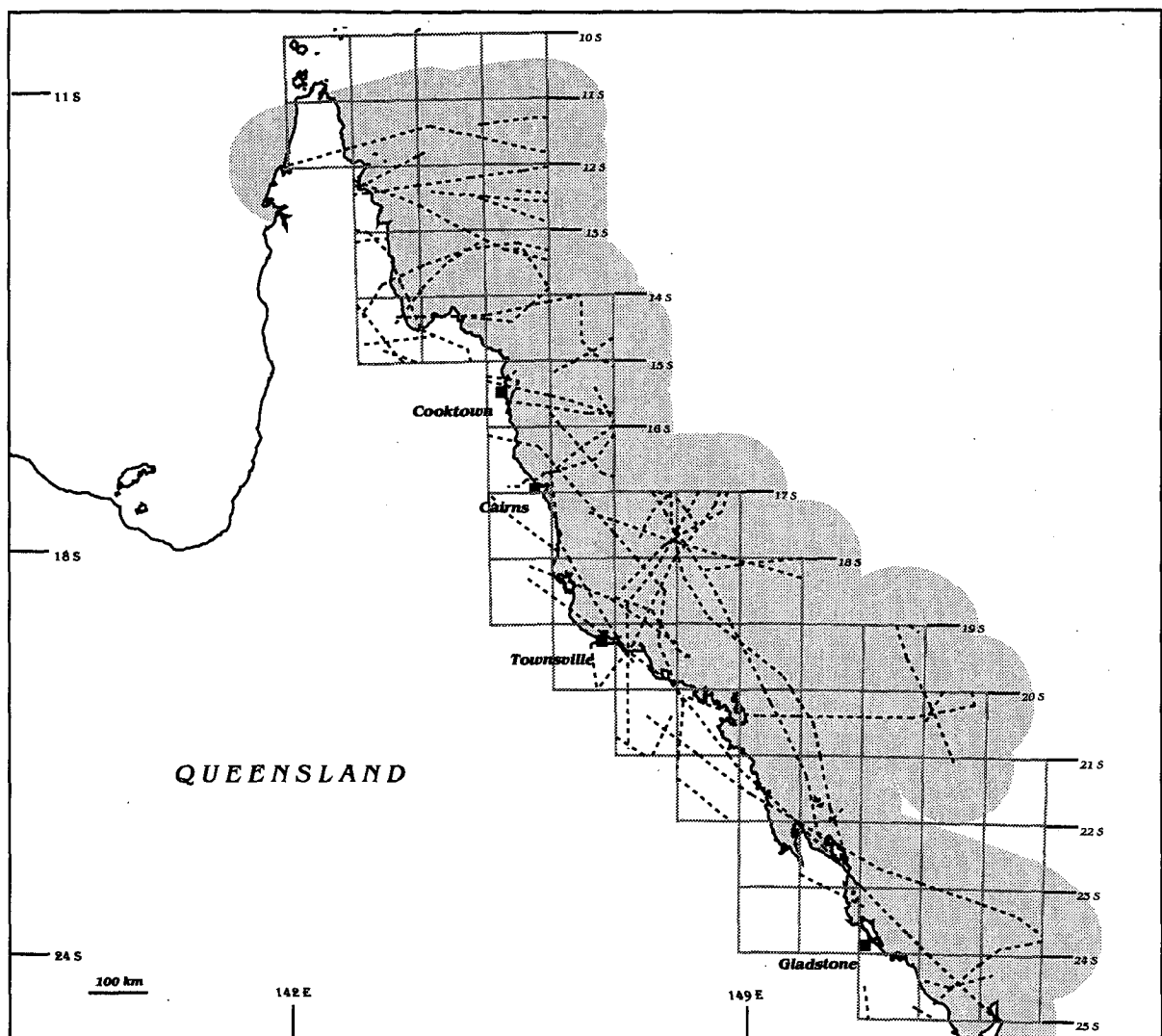
Map 16: *Category 0 cyclones 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



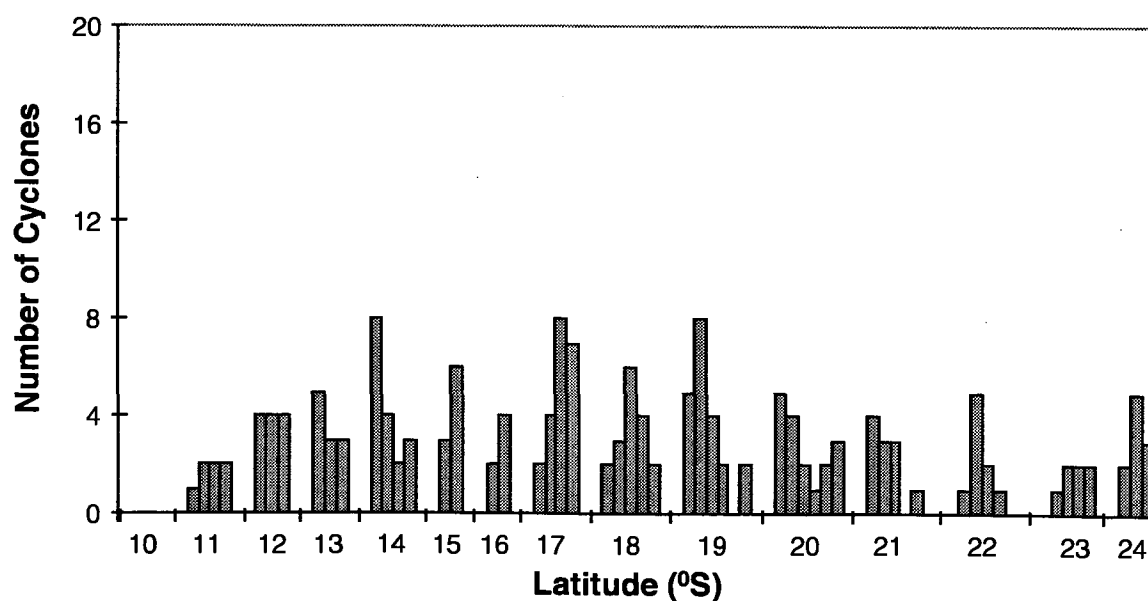
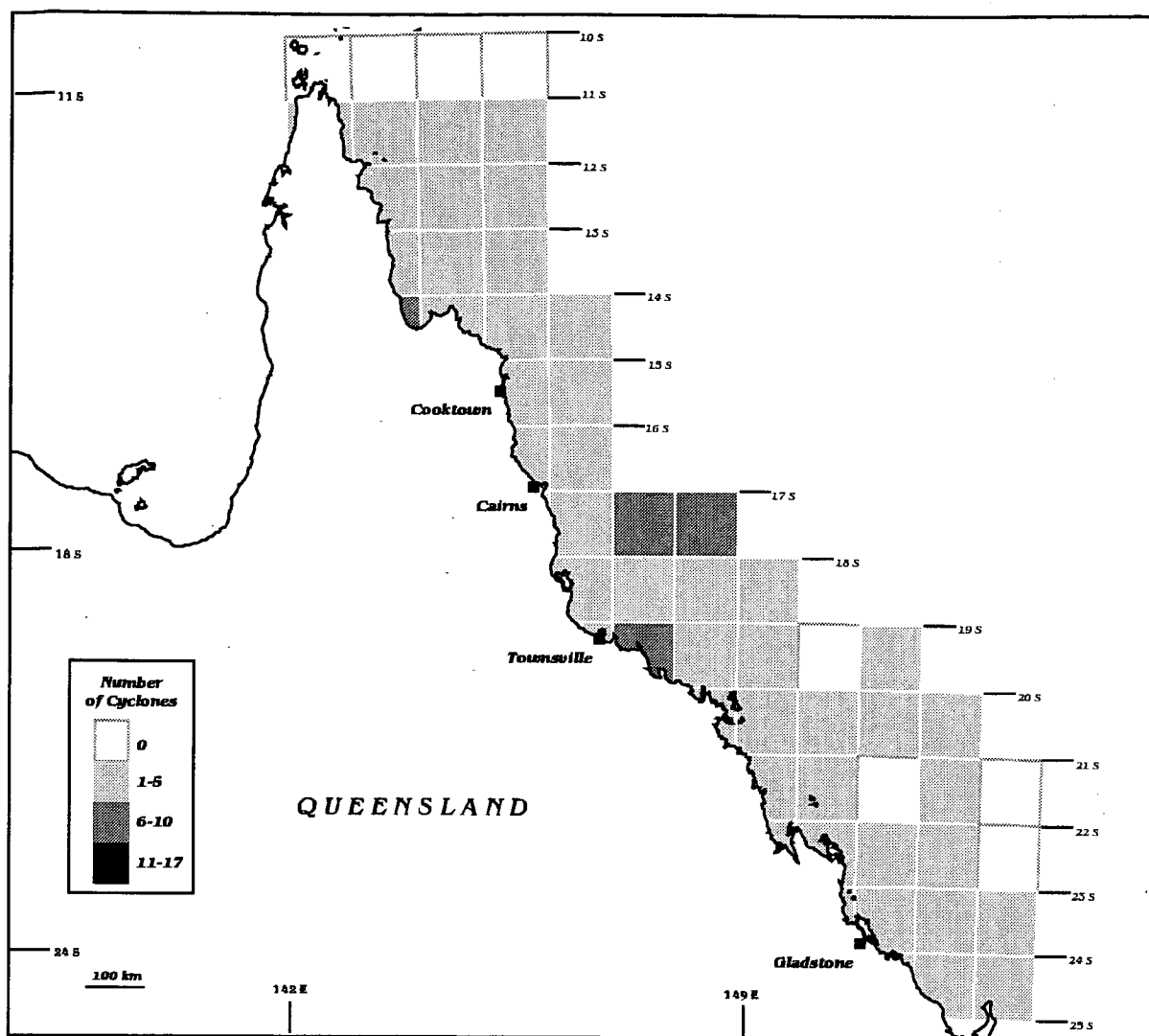
Map 17: *Category 0 cyclones 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



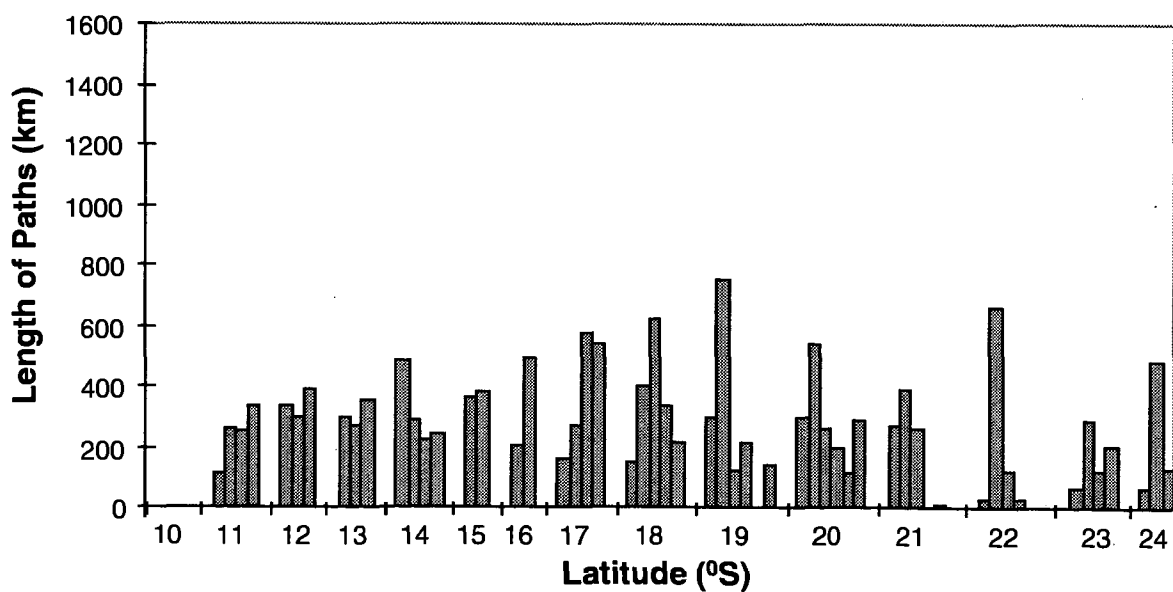
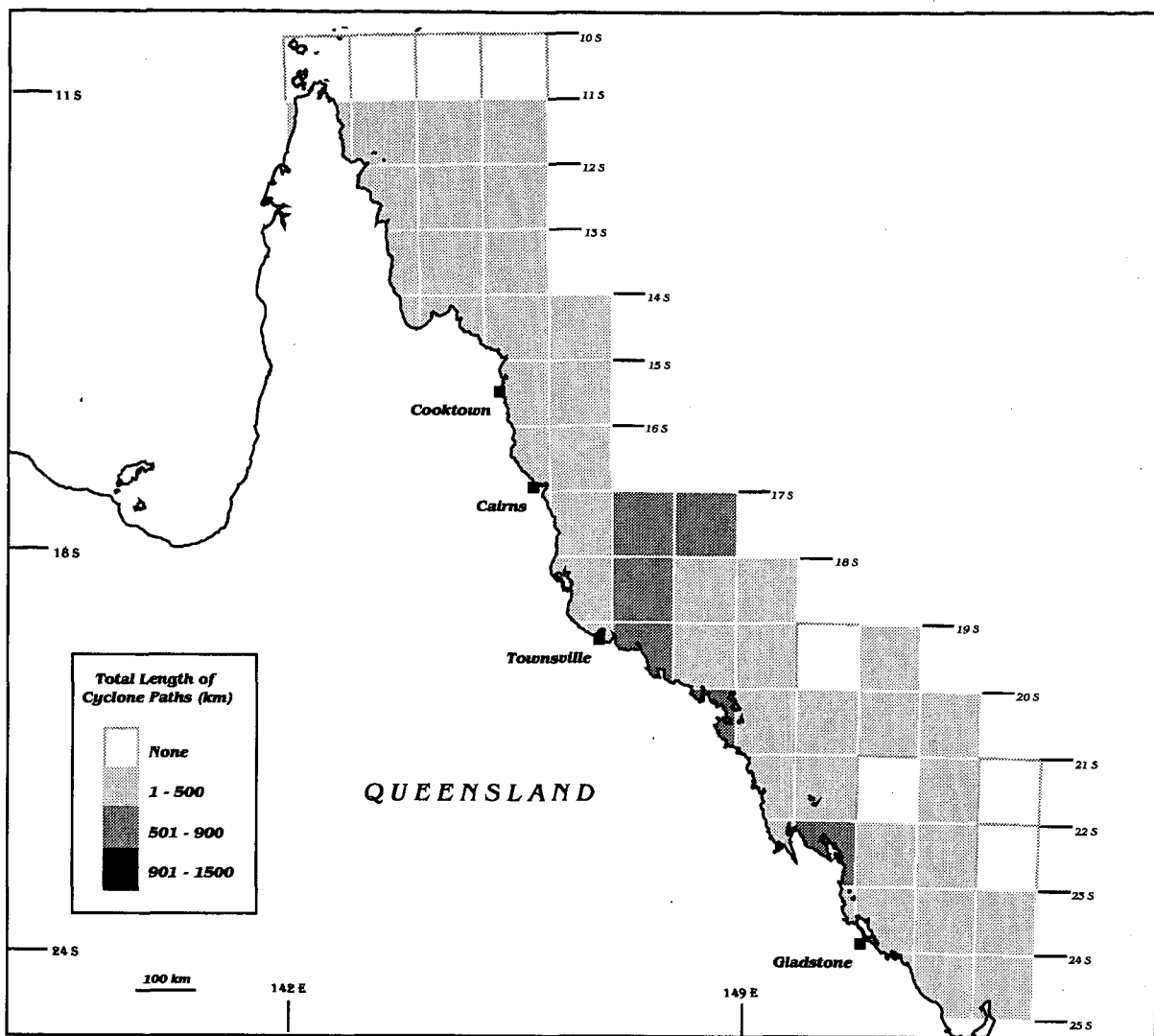
Map 18 : *Number of years before 1997 since the last category 0 cyclone. Boxes classified as 30+ years have had no category 0 cyclones pass through them from 1969 to 1997.*



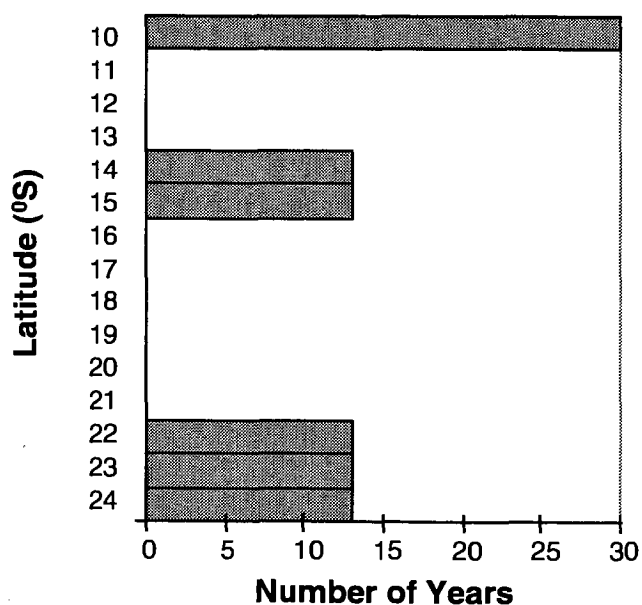
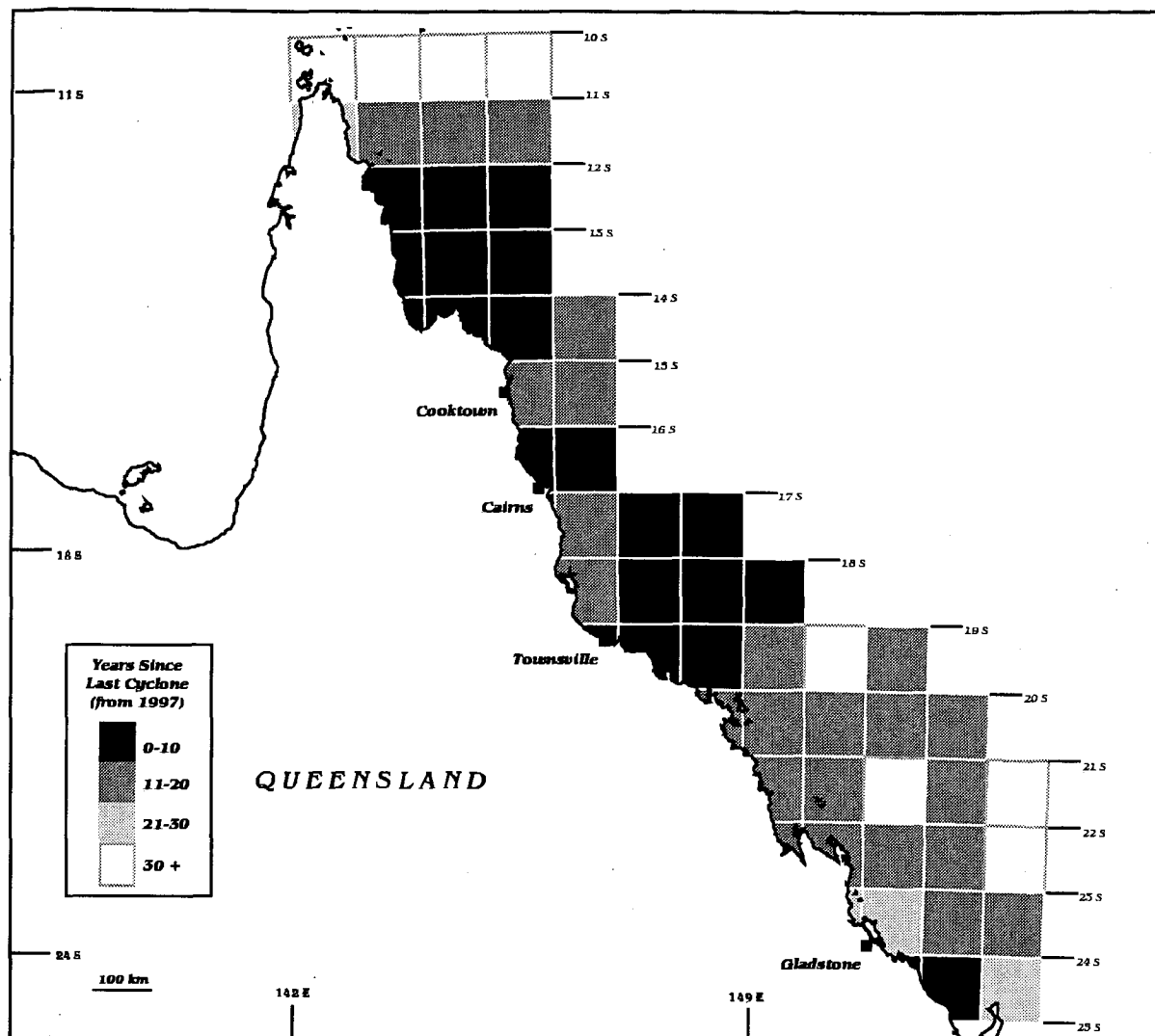
Map 19: Category 1 cyclones 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of category 1 cyclones by latitude.



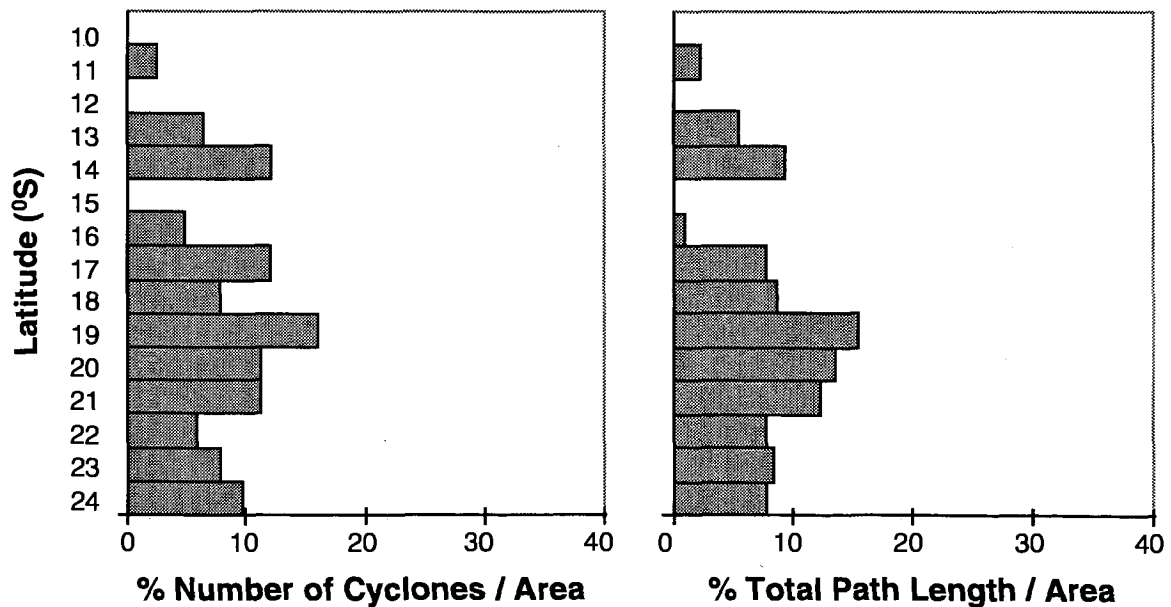
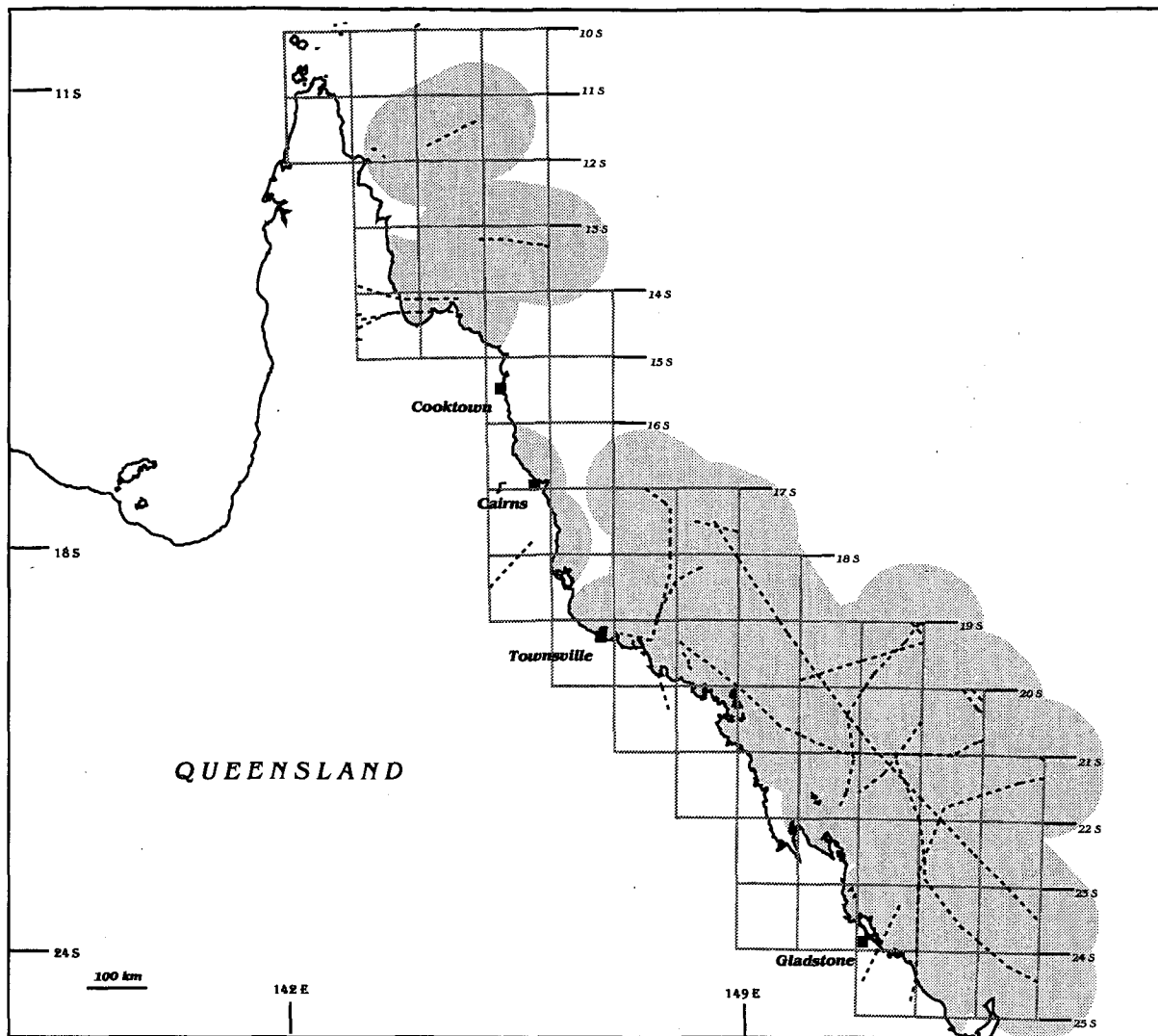
Map 20: *Category 1 cyclones 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



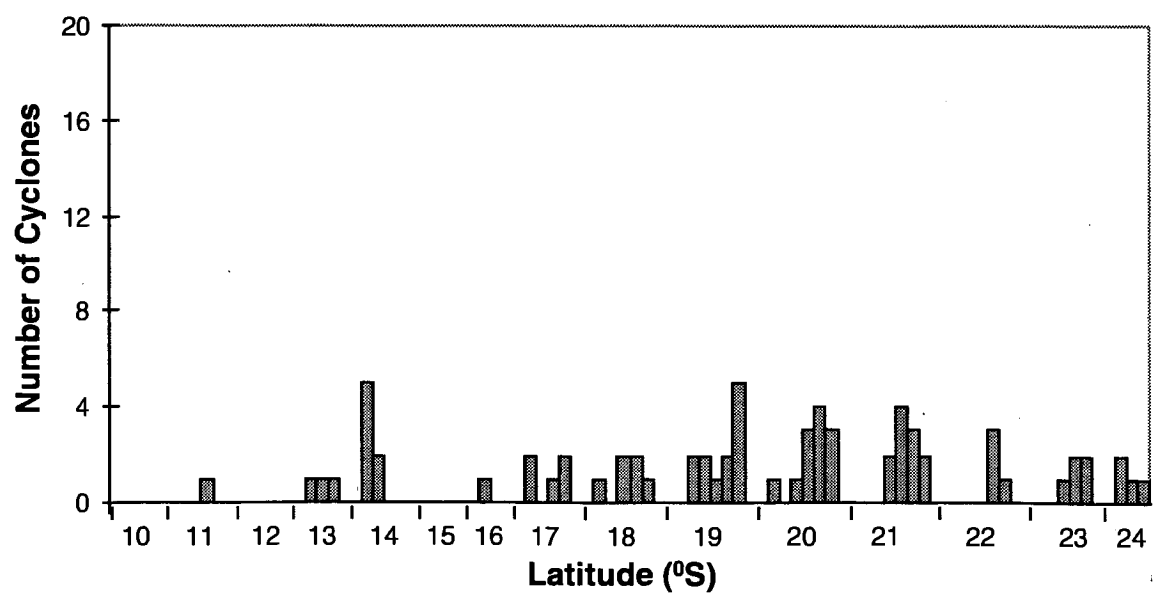
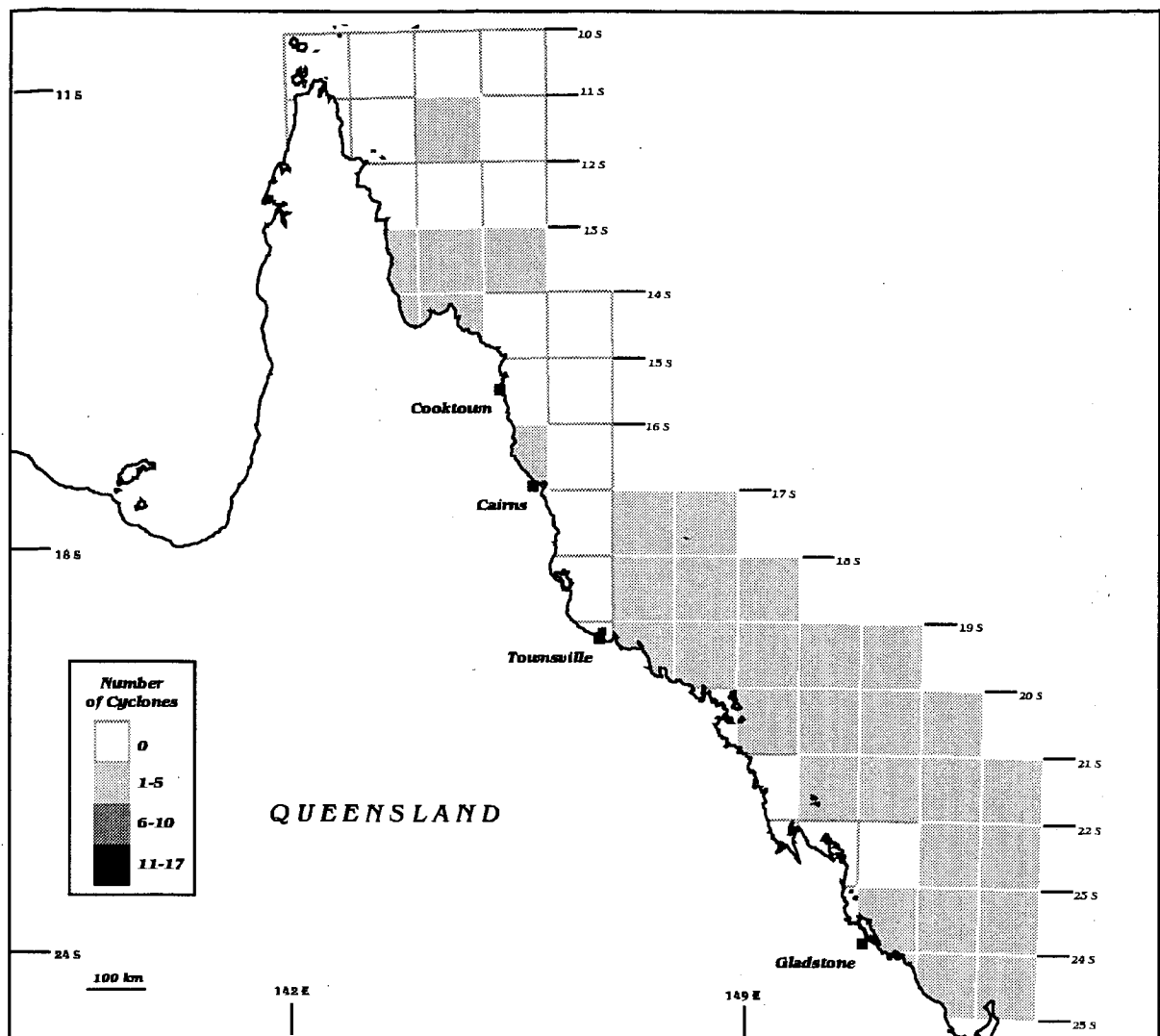
Map 21: *Category 1 cyclones 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



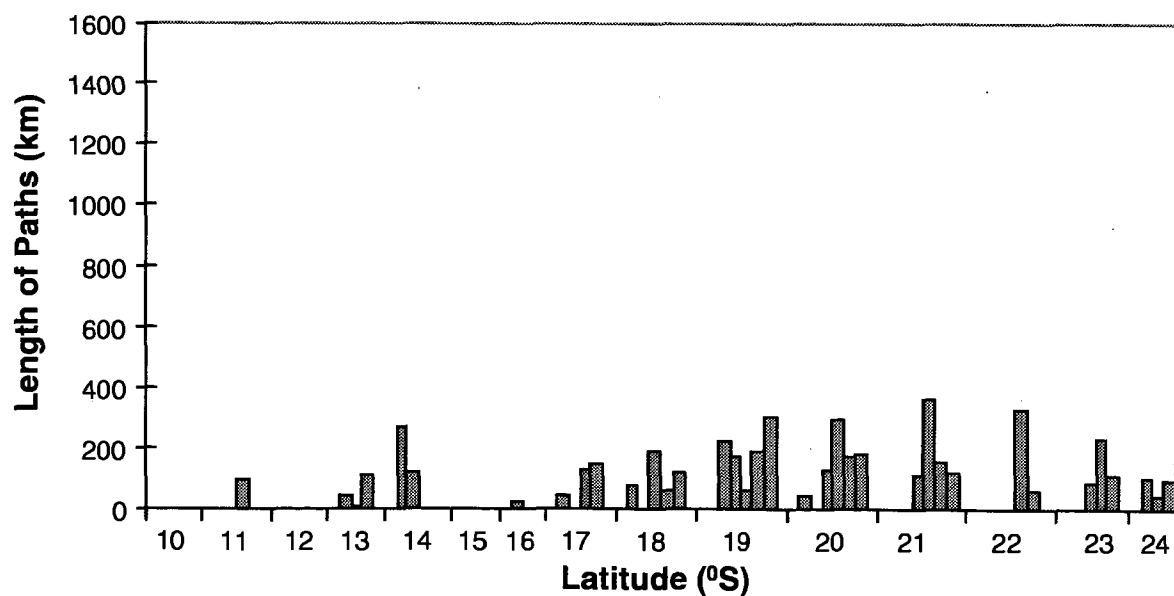
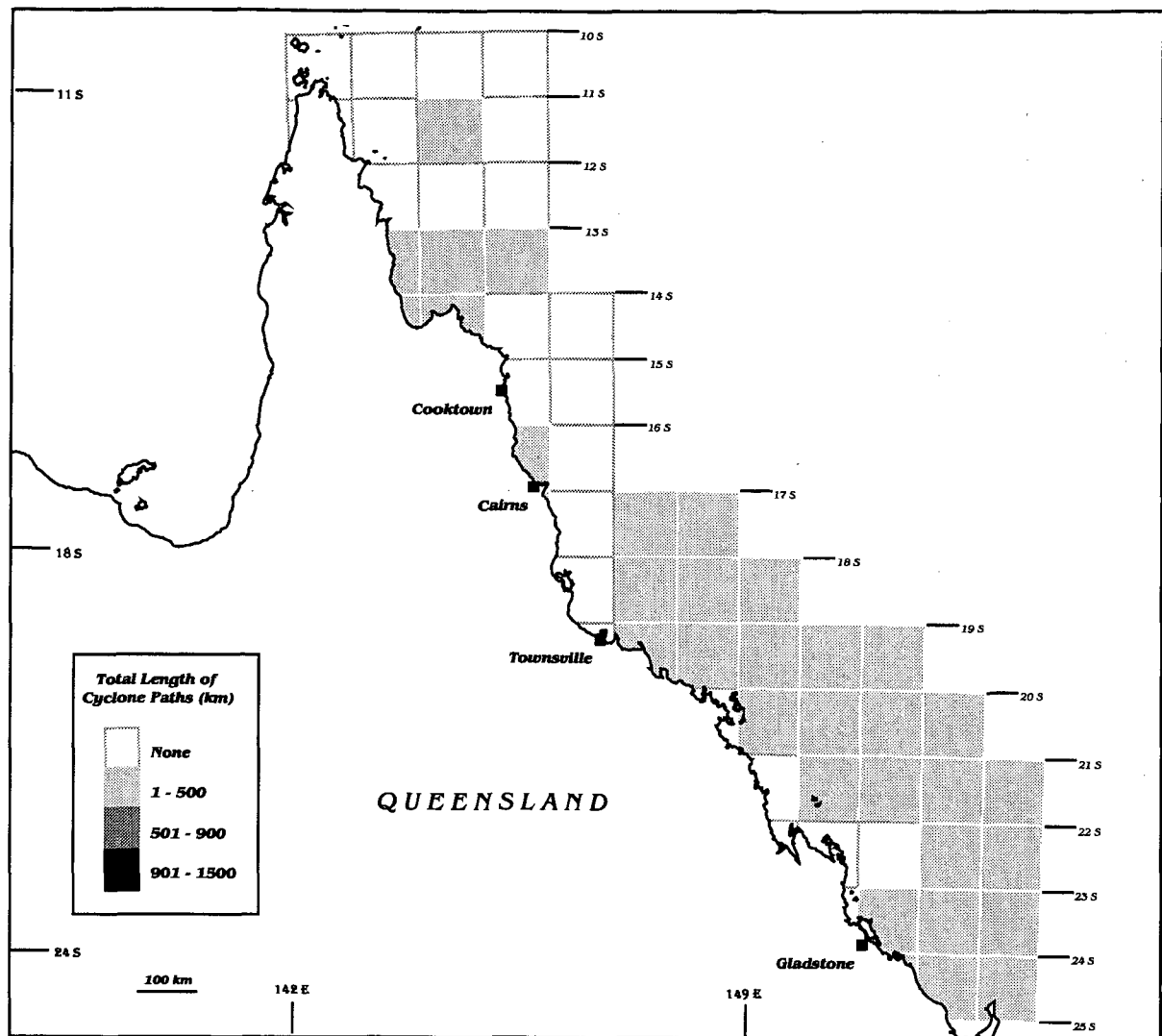
Map 22: *Number of years before 1997 since the last category 1 cyclone. Boxes classified as 30+ years have had no category 1 cyclones pass through them from 1969 to 1997.*



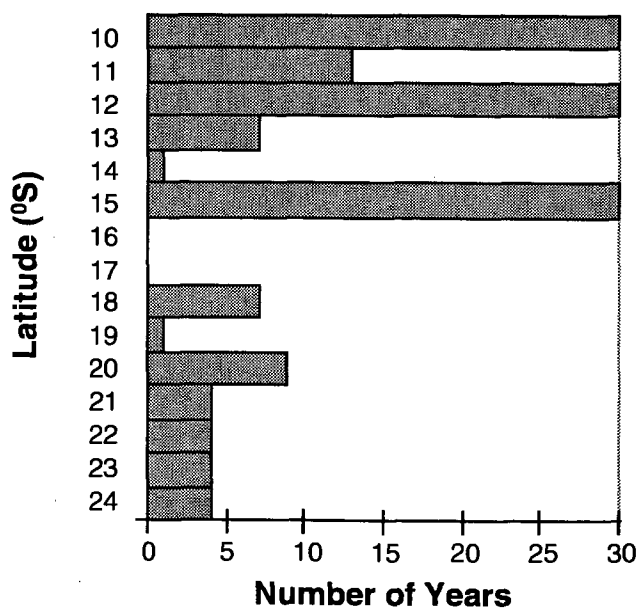
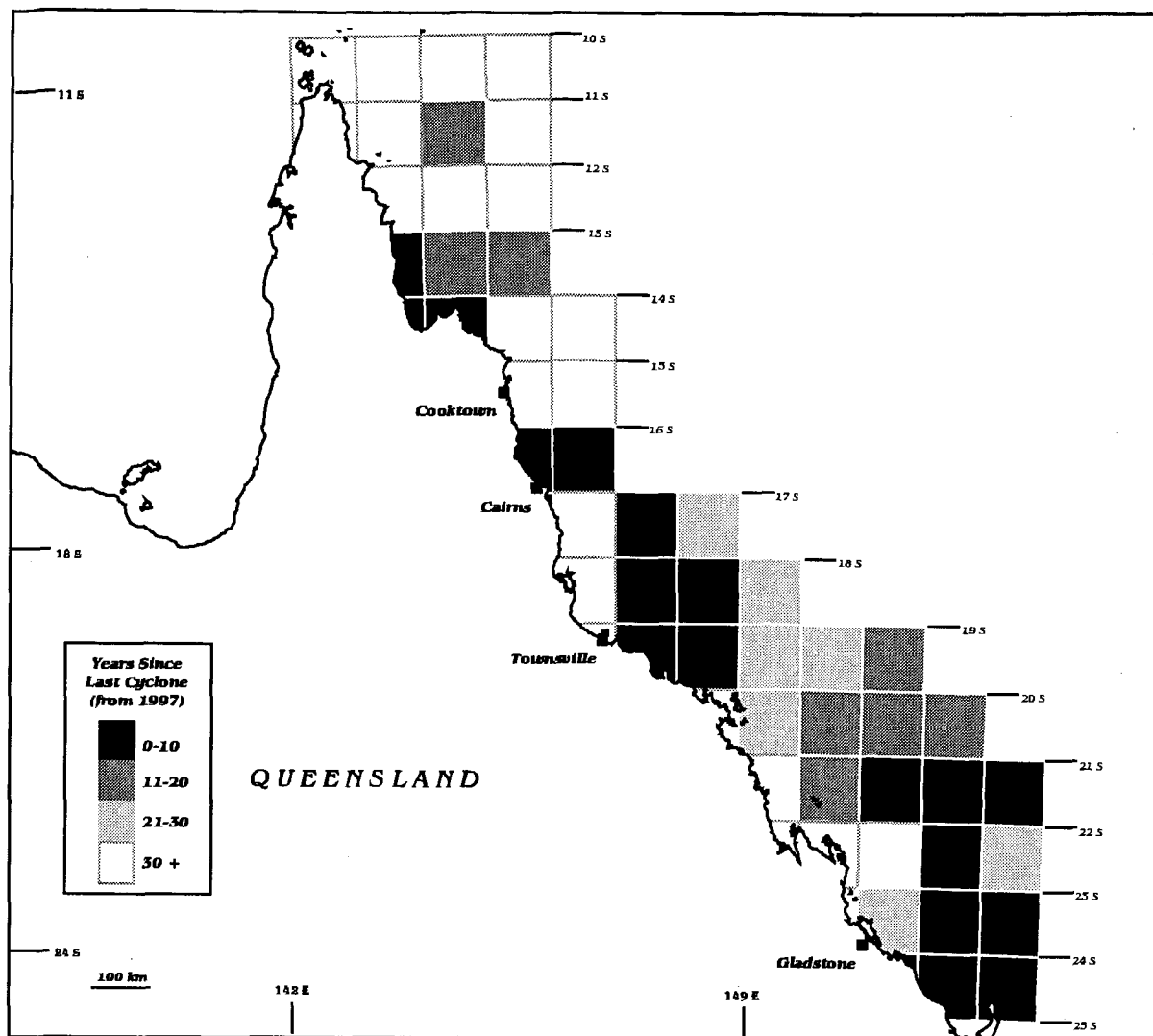
Map 23: Category 2 cyclones 1969-1997. Dashed lines represent cyclone paths and shading indicates areas located within 100 km of at least one path. The graphs indicate peaks in the number and total path length of category 2 cyclones by latitude.



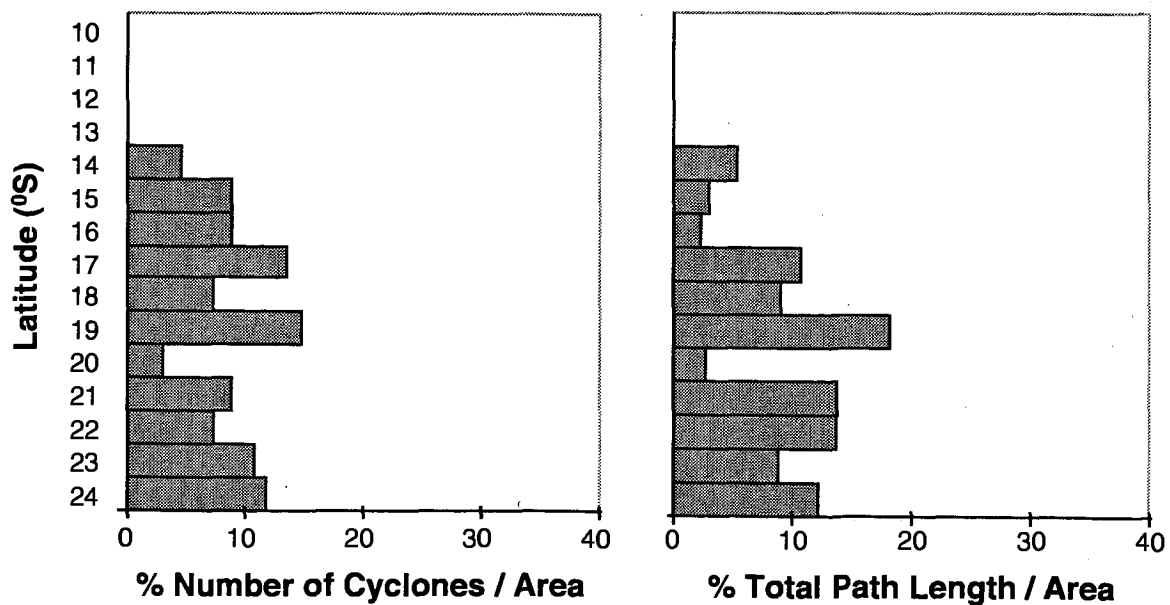
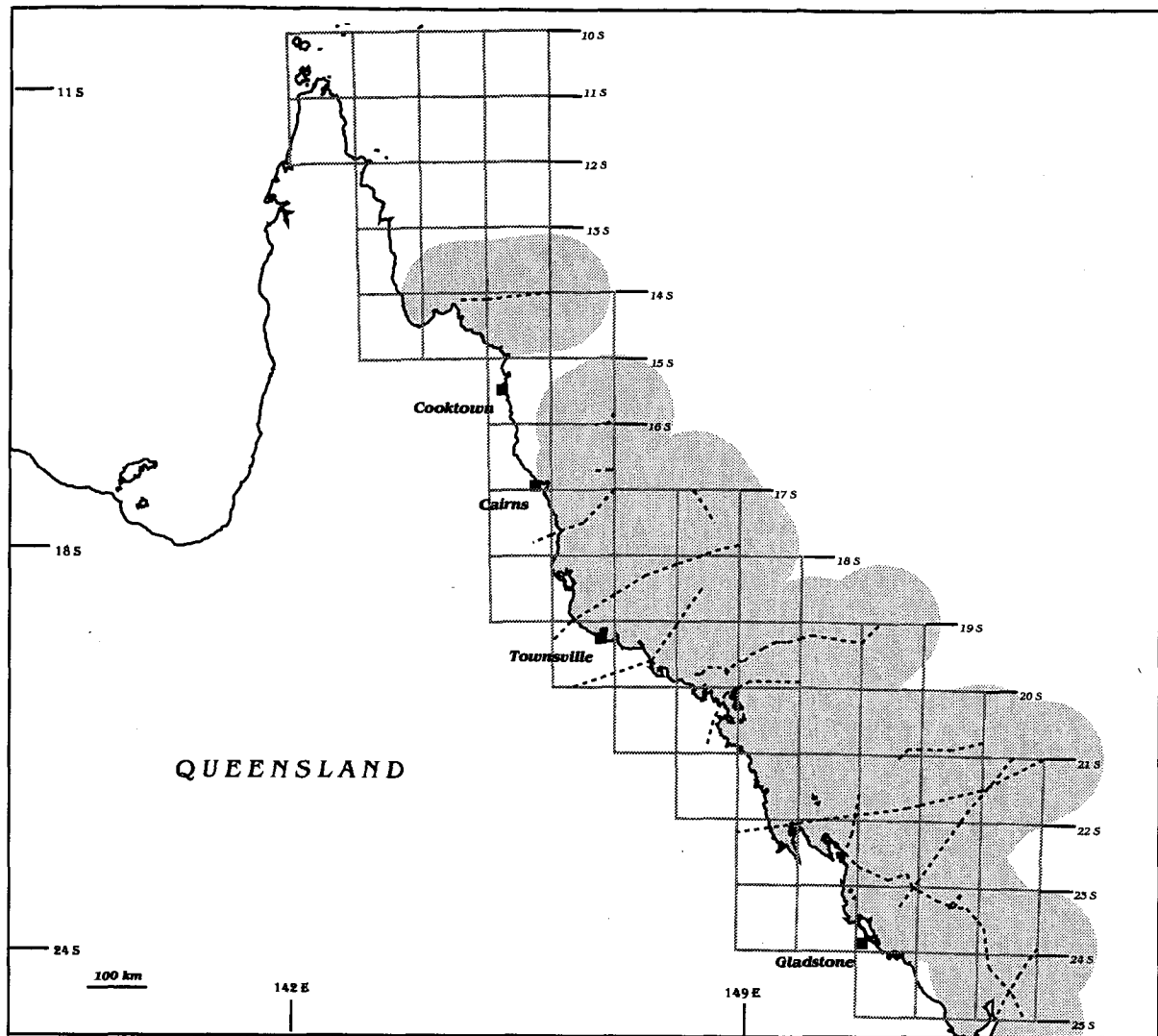
Map 24: *Category 2 cyclones 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



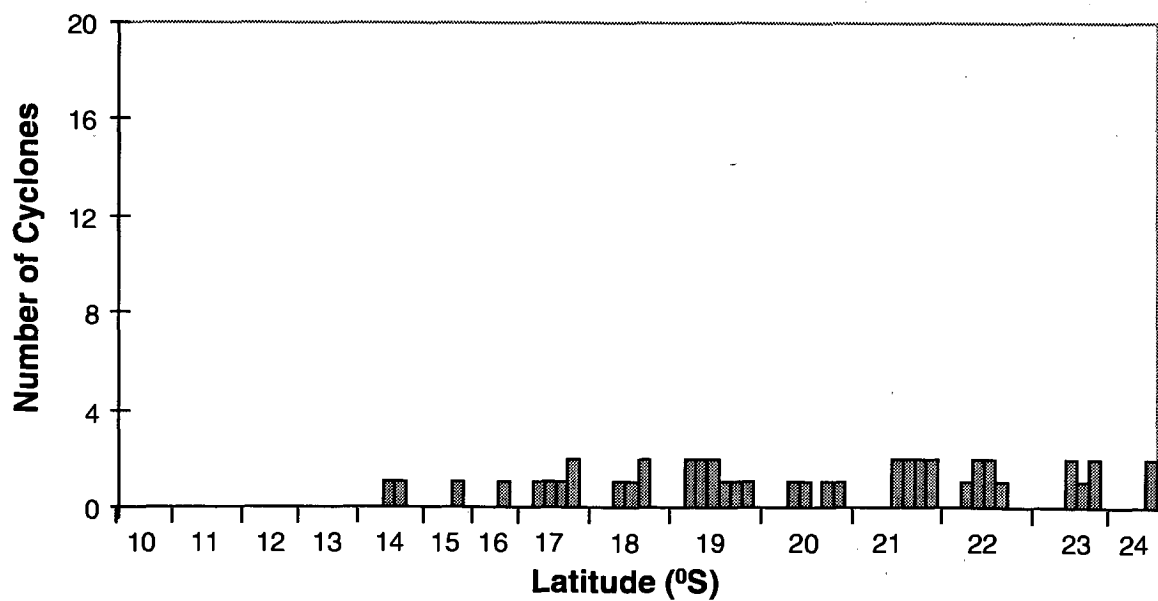
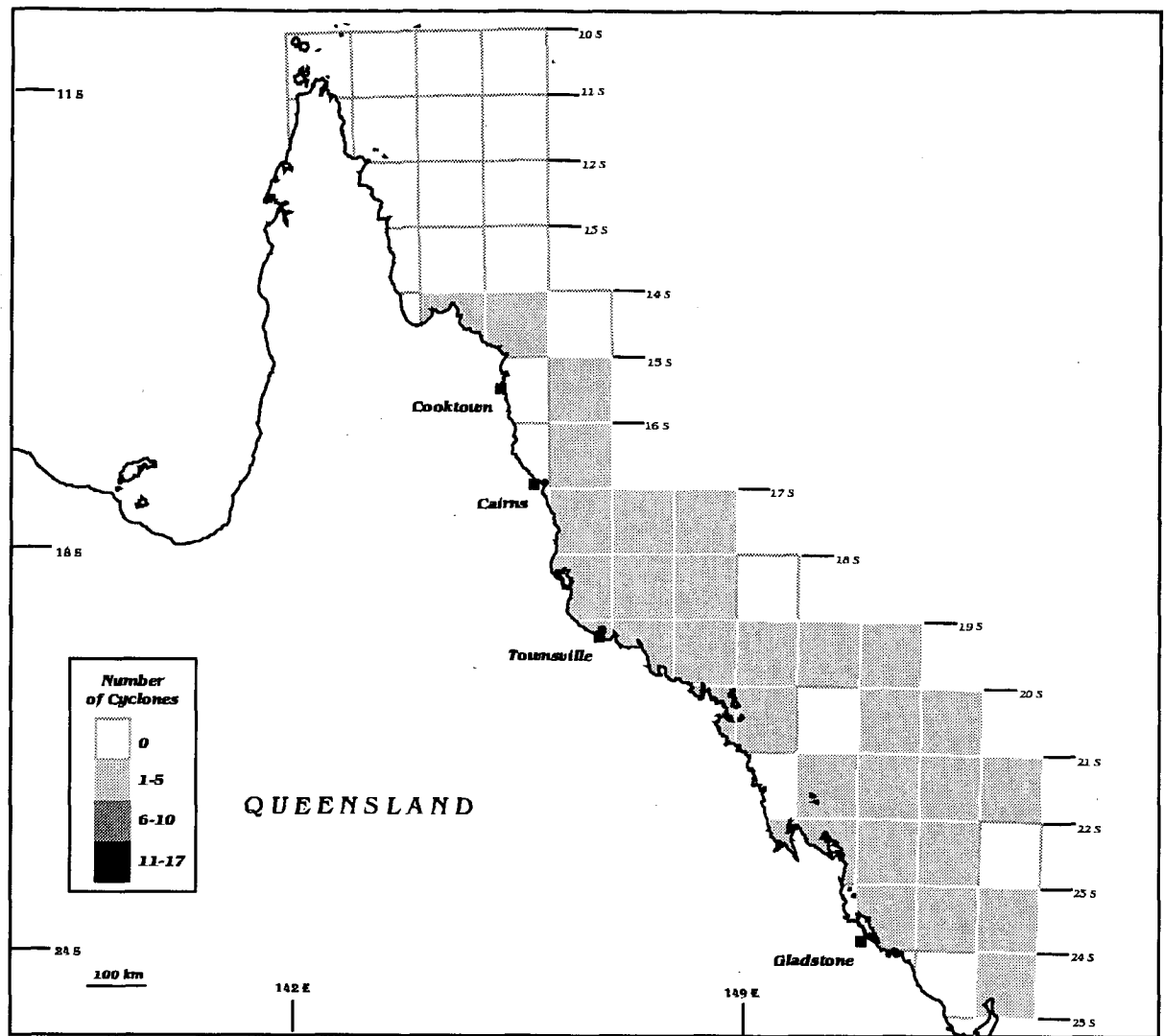
Map 25: *Category 2 cyclones 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



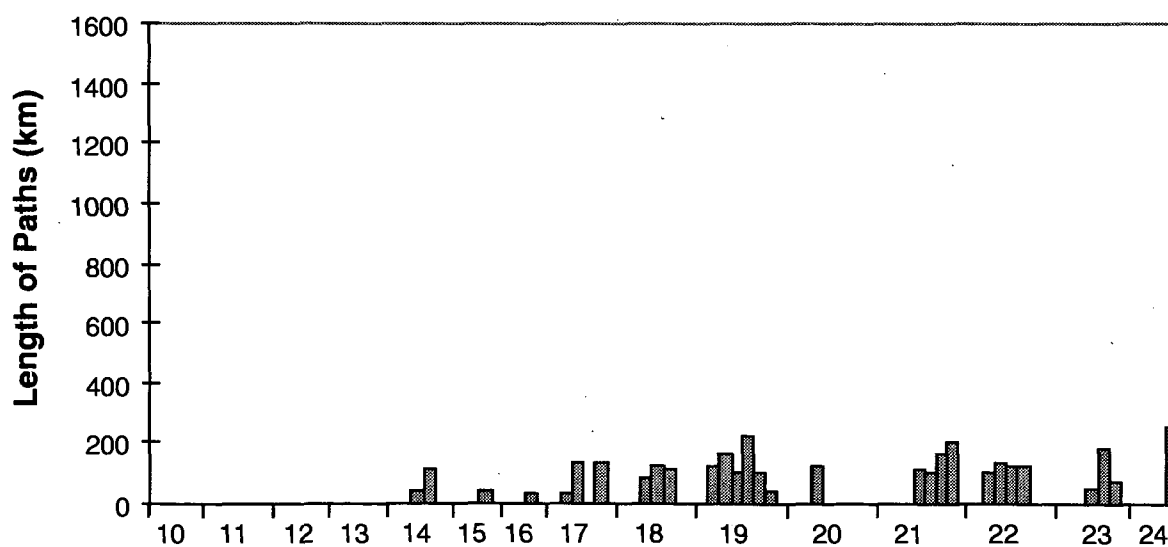
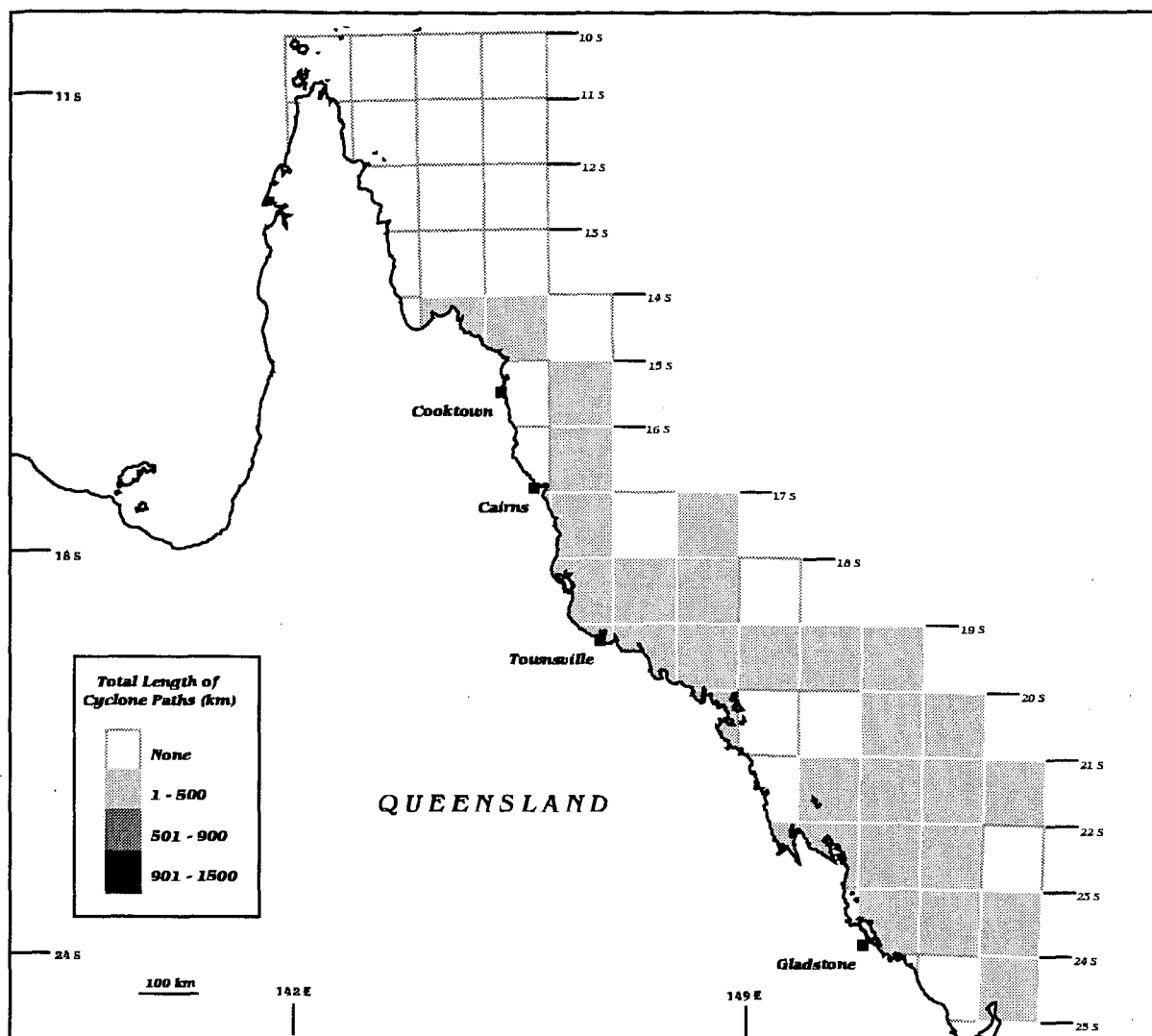
Map 26 : *Number of years before 1997 since the last category 2 cyclone. Boxes classified 30+ years have had no category 2 cyclones pass through them from 1969 to 1997.*



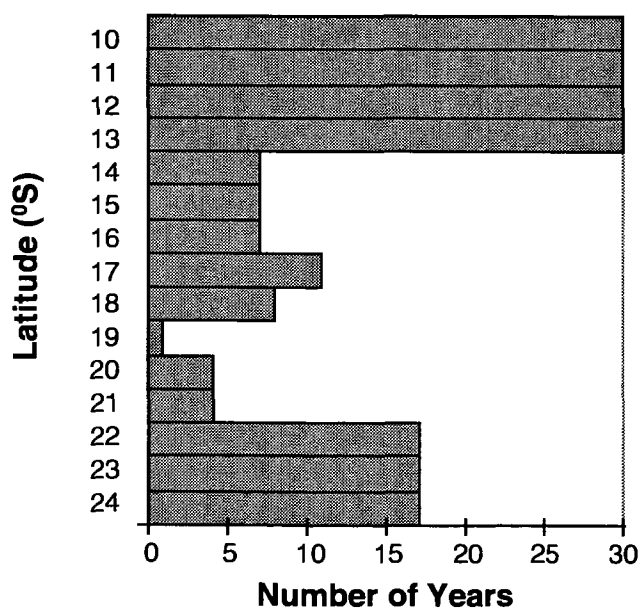
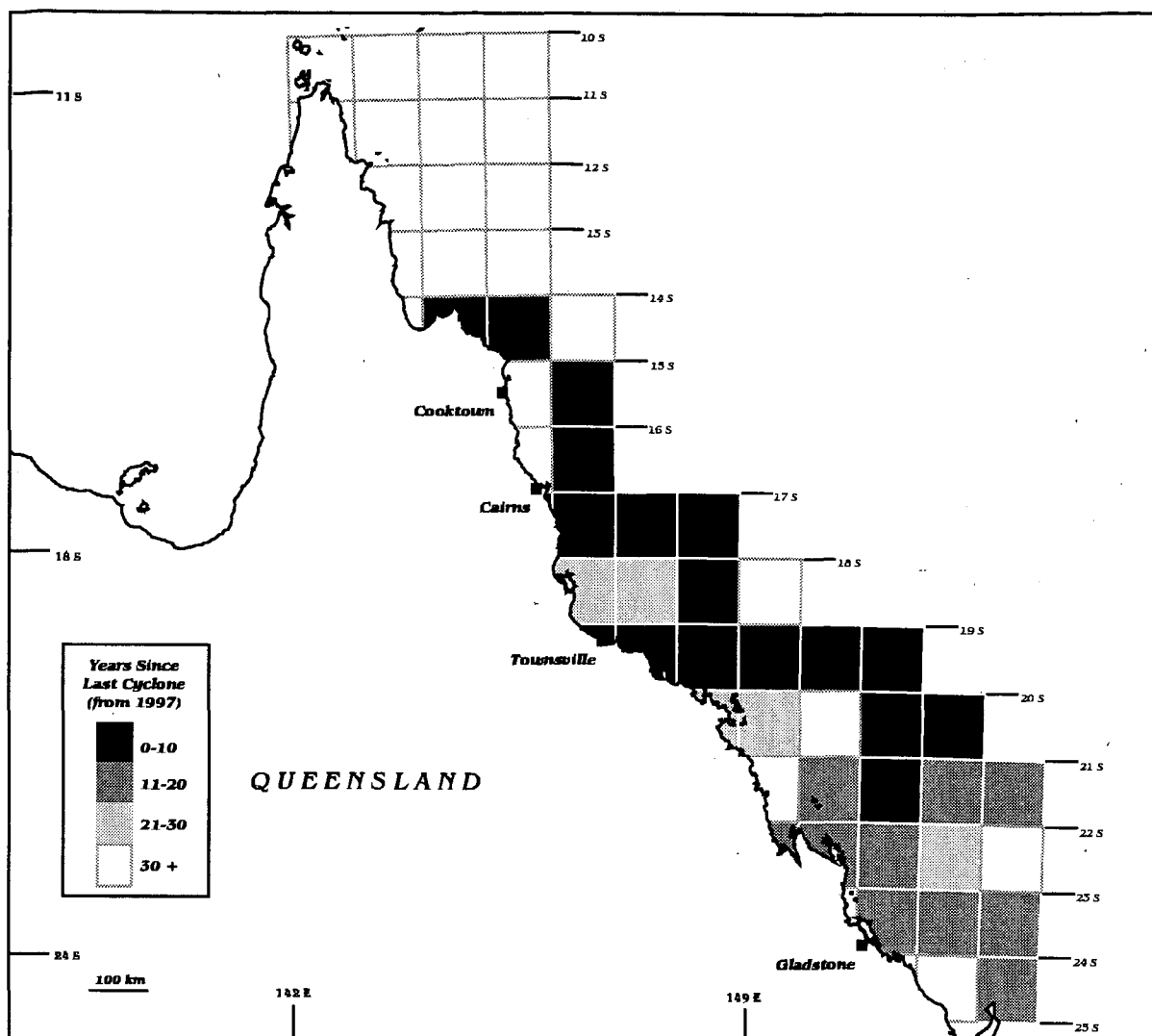
Map 27: Category 3 cyclones 1969-1997. Dashed lines represent the cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of category 3 cyclones by latitude.



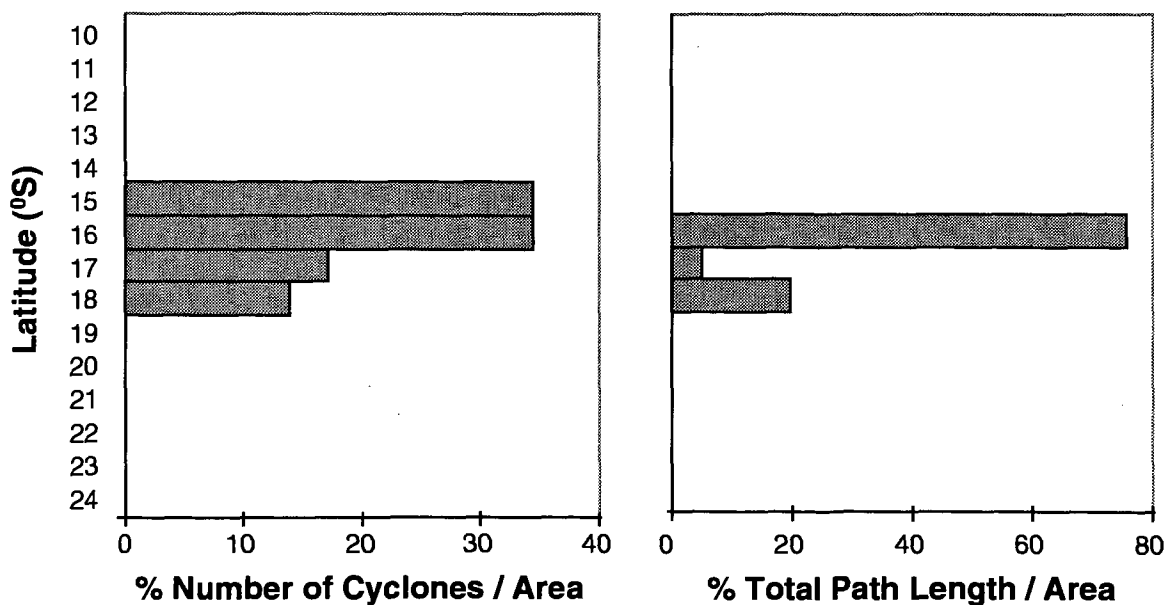
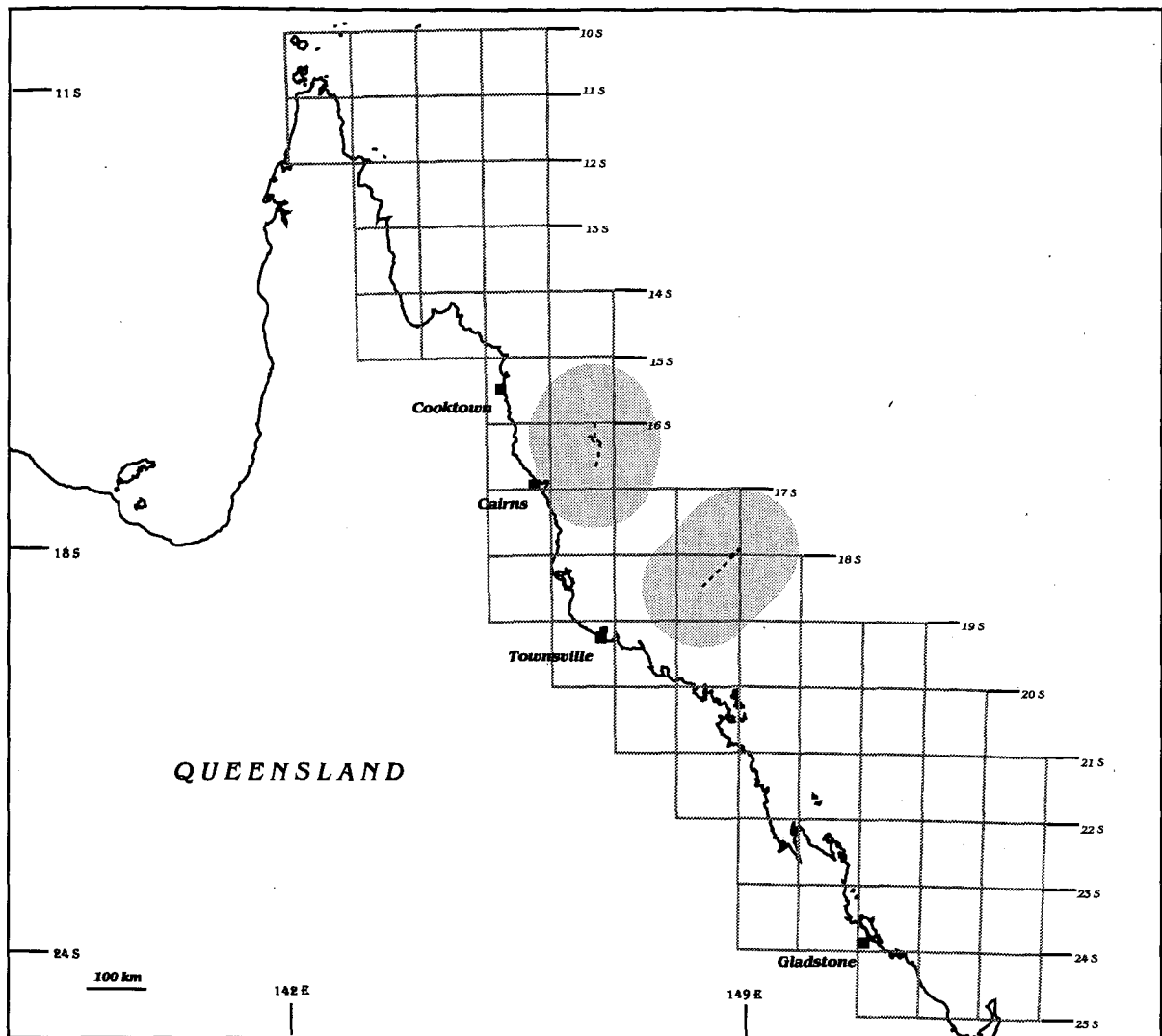
Map 28: *Category 3 cyclones 1969-1997; number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



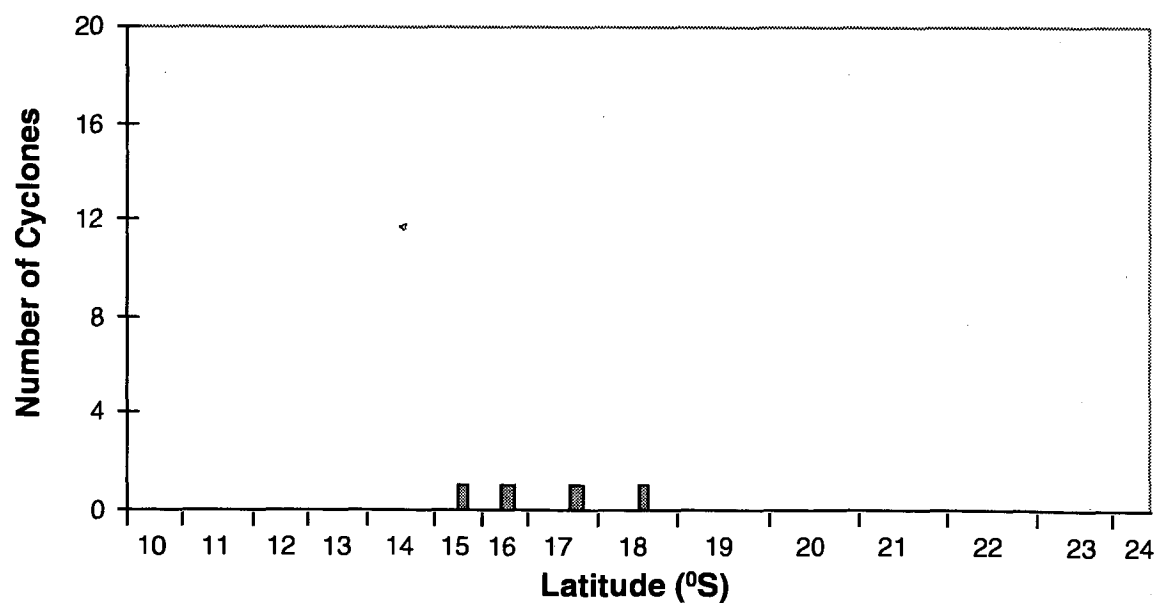
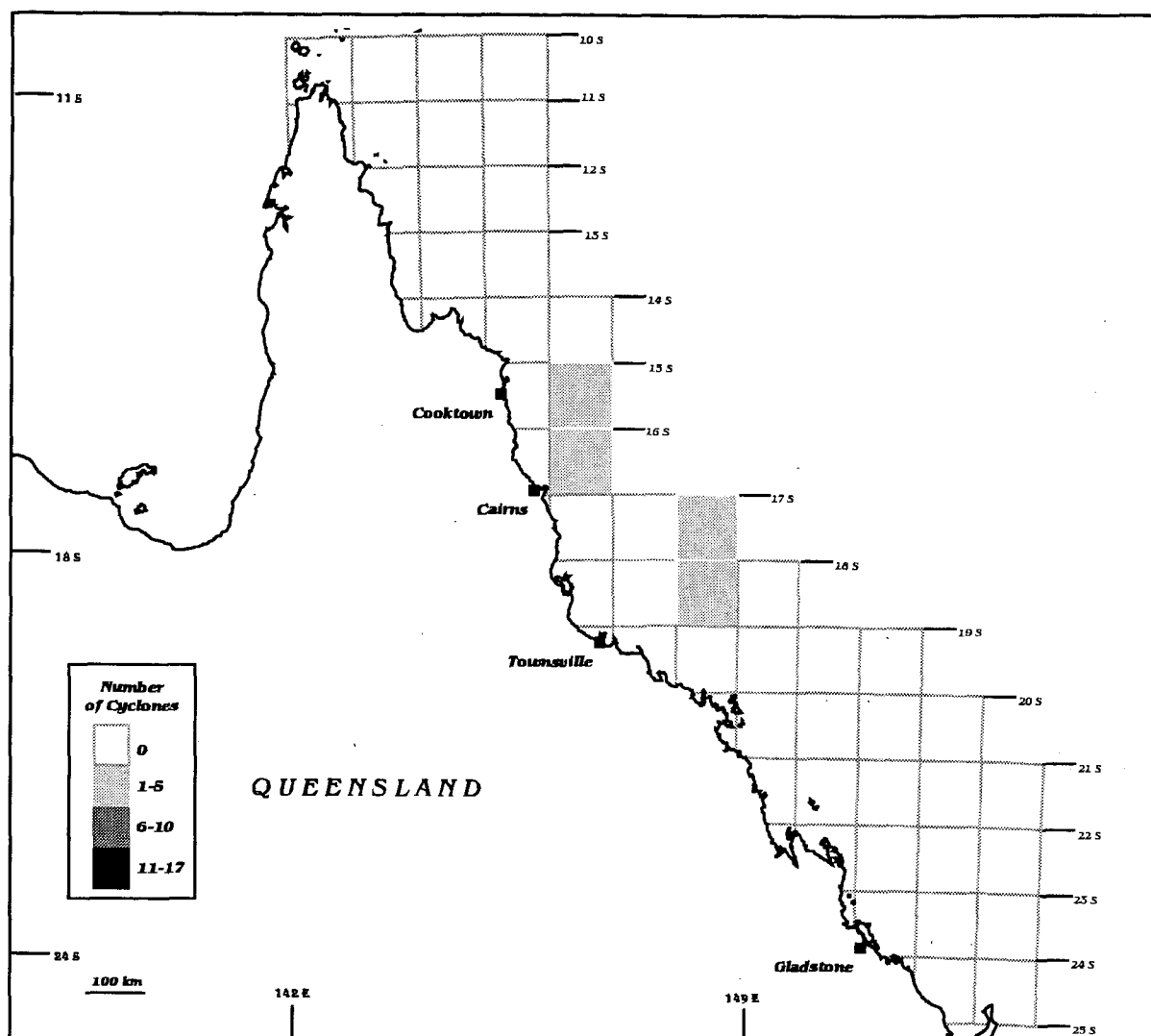
Map 29: *Category 3 cyclones 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



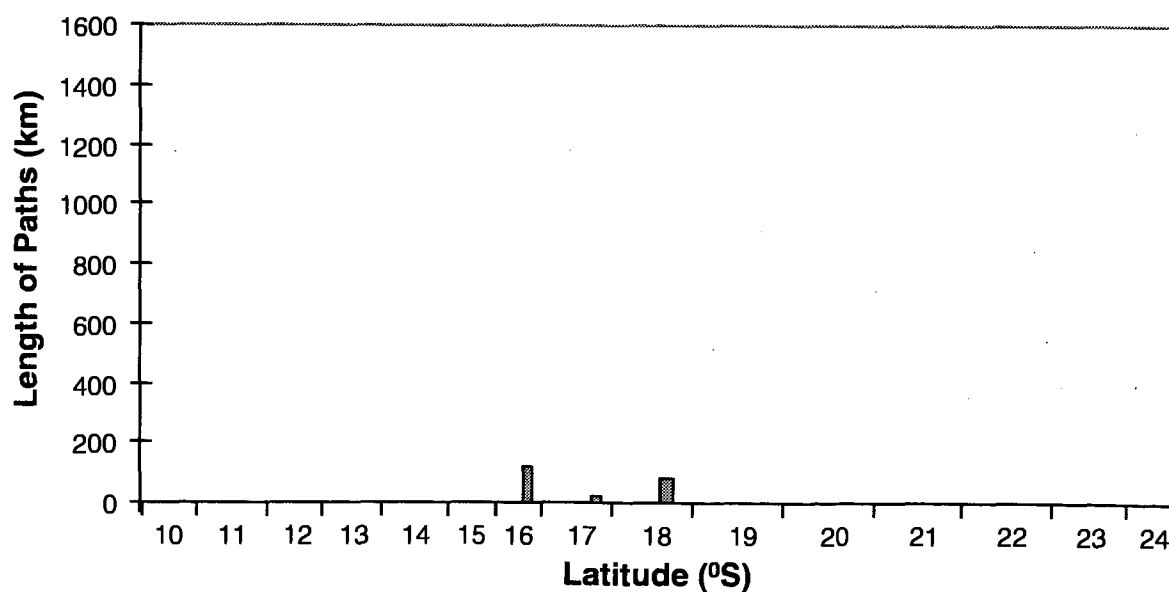
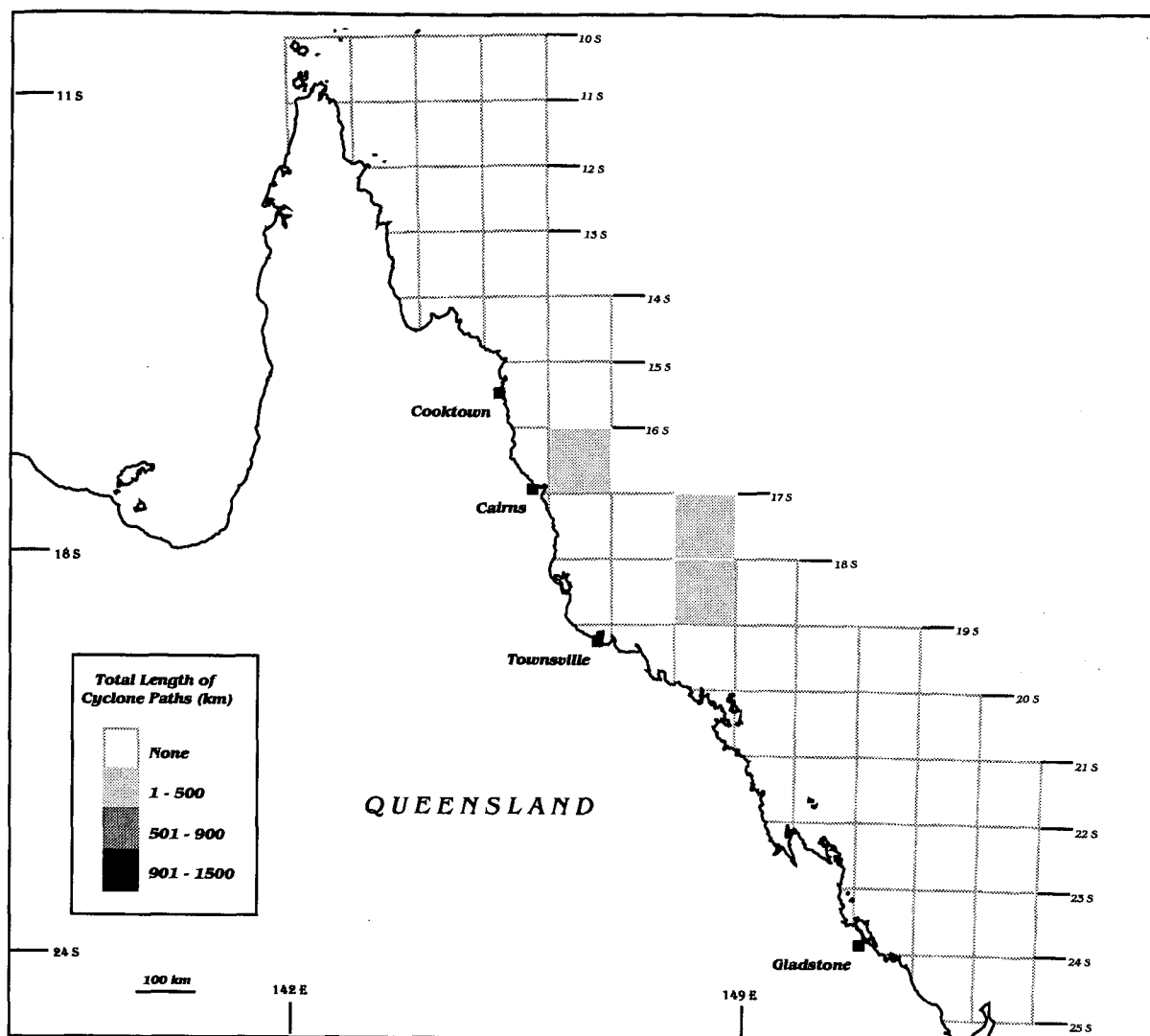
Map 30 : *Number of years before 1997 since the last category 3 cyclone. Boxes classified as 30+ years have had no category 3 cyclones pass through them from 1969 to 1997.*



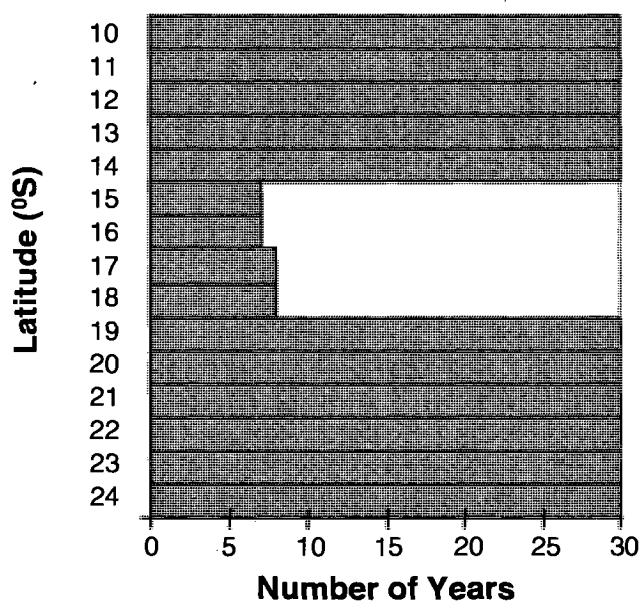
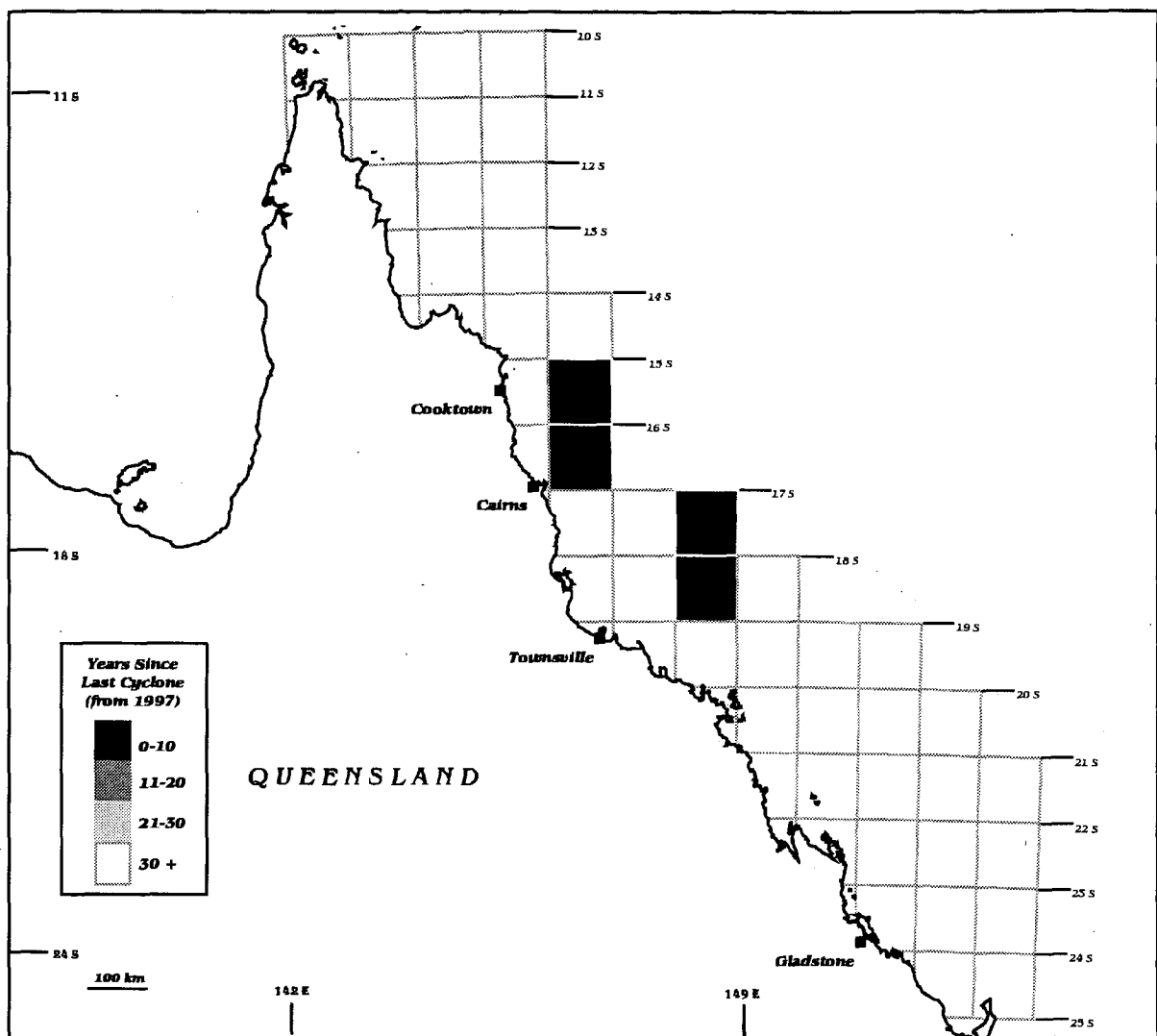
Map 31: Category 4 cyclones 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of category 4 cyclones by latitude.



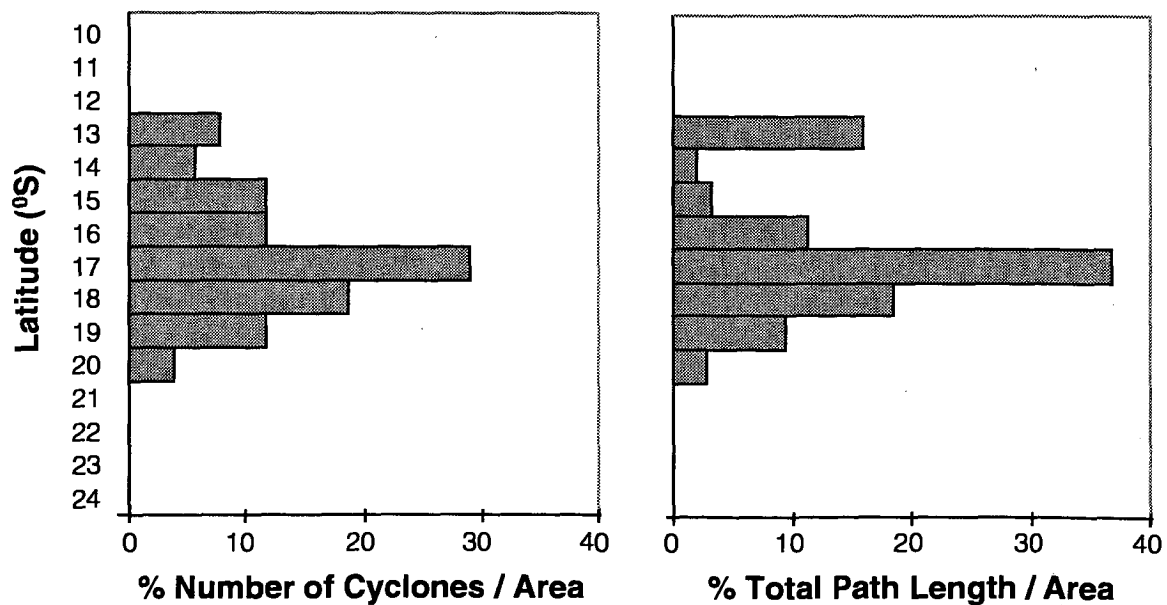
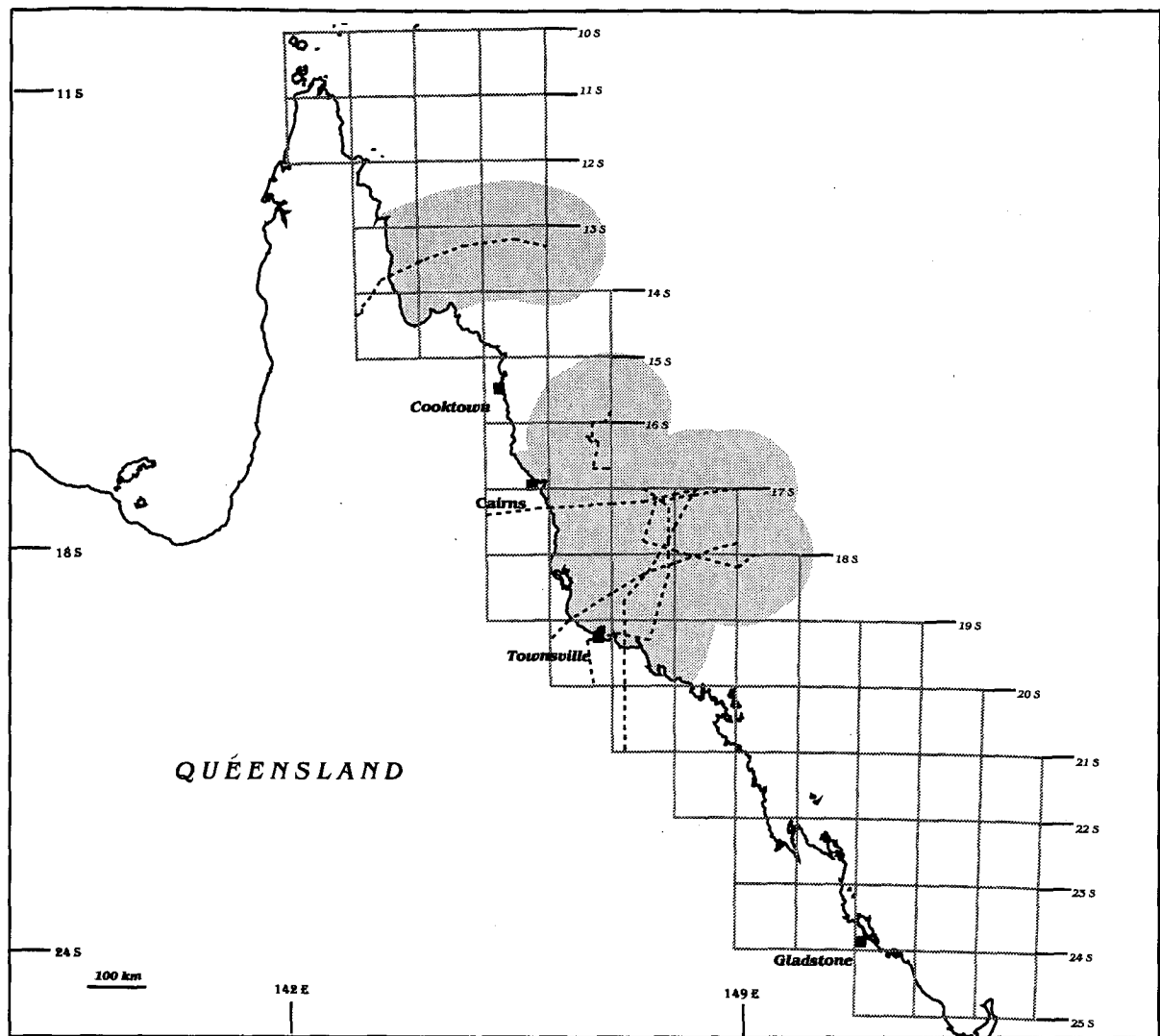
Map 32: *Category 4 cyclones 1969-1997: number of cyclones. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



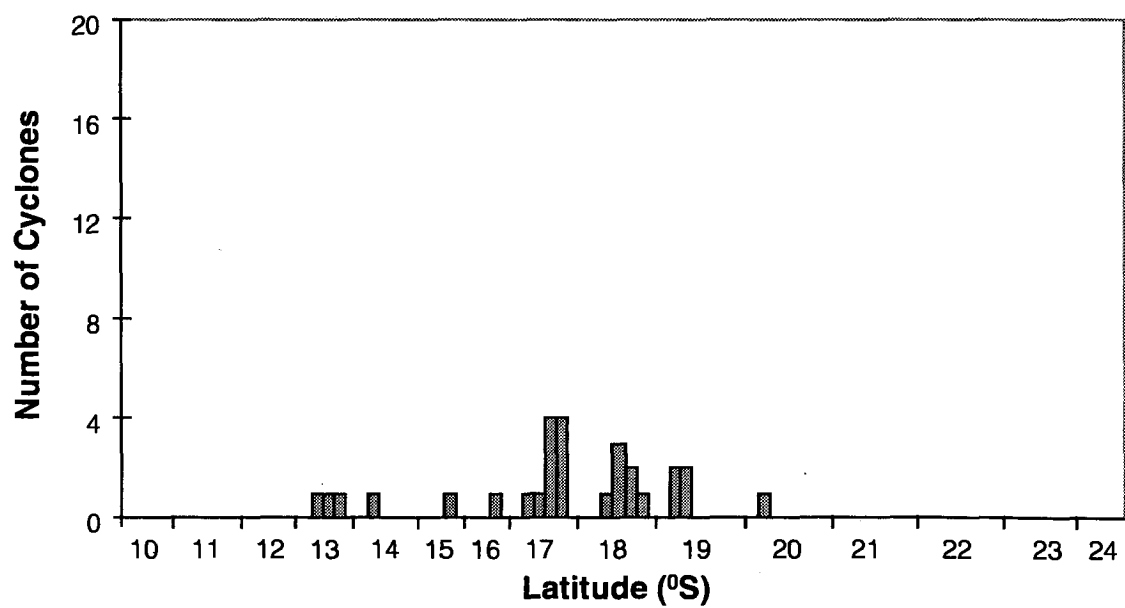
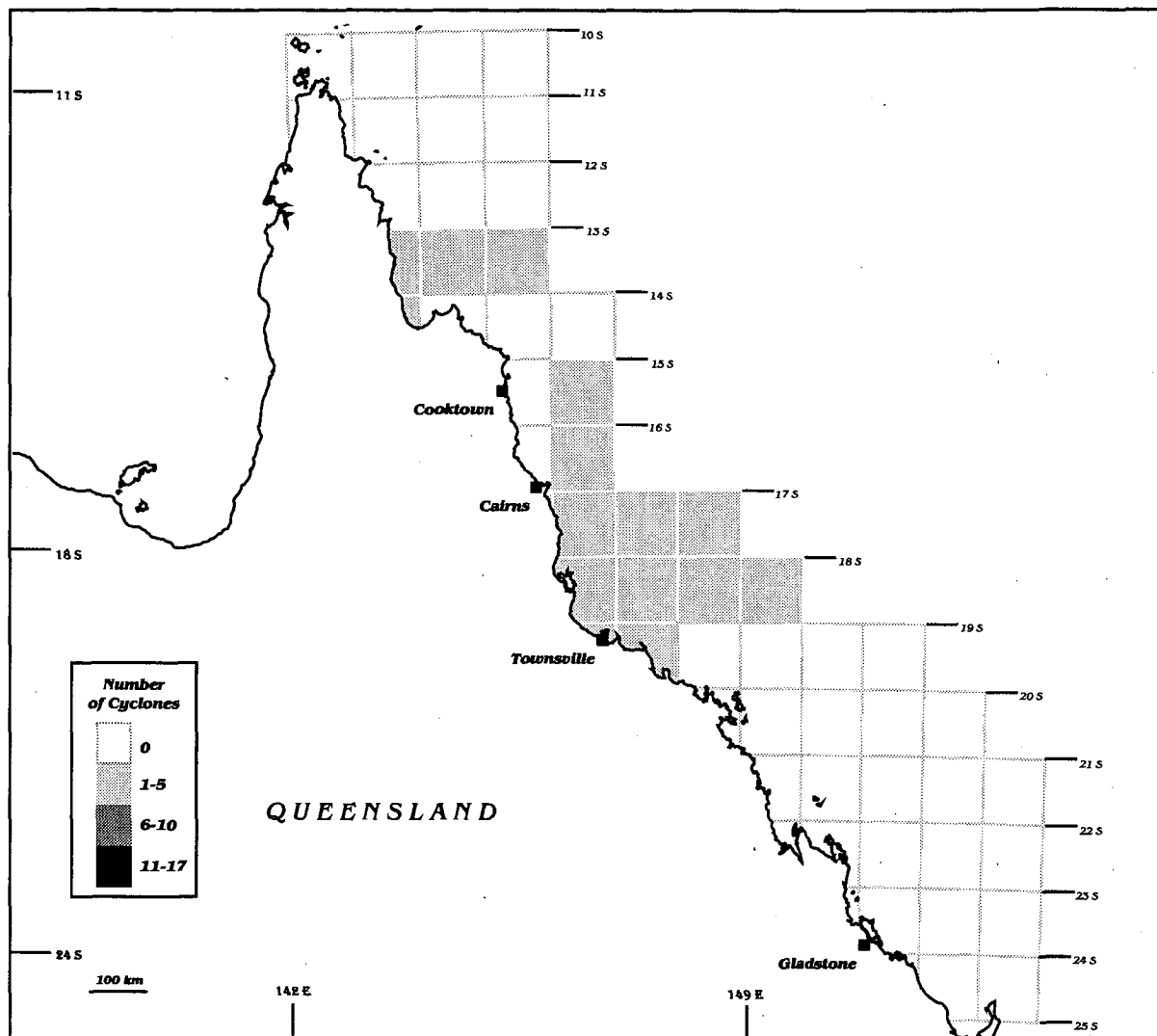
Map 33: *Category 4 cyclones 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



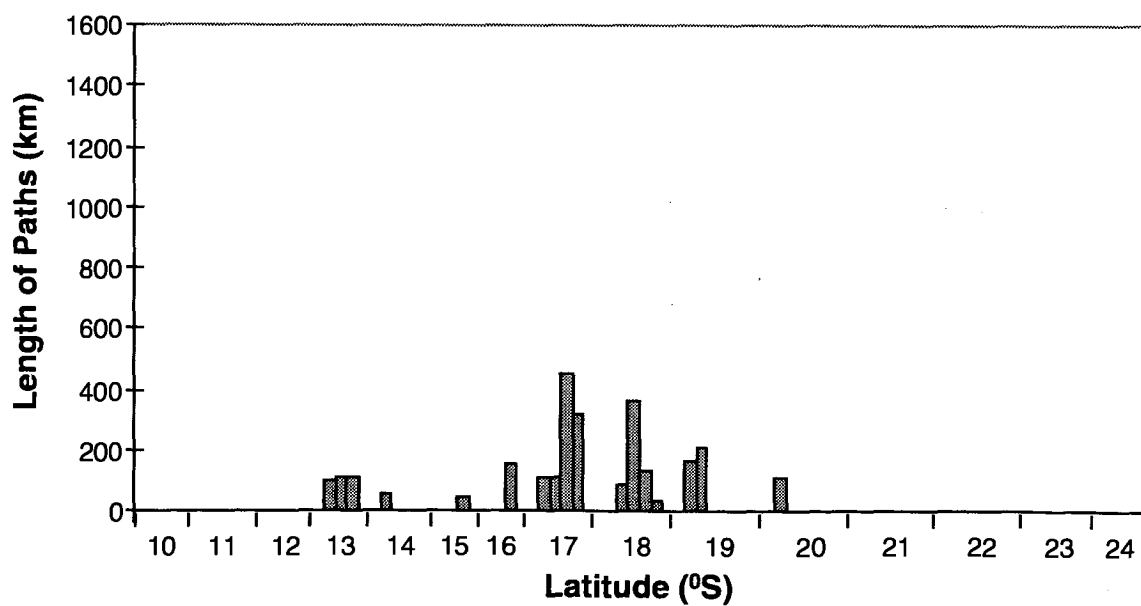
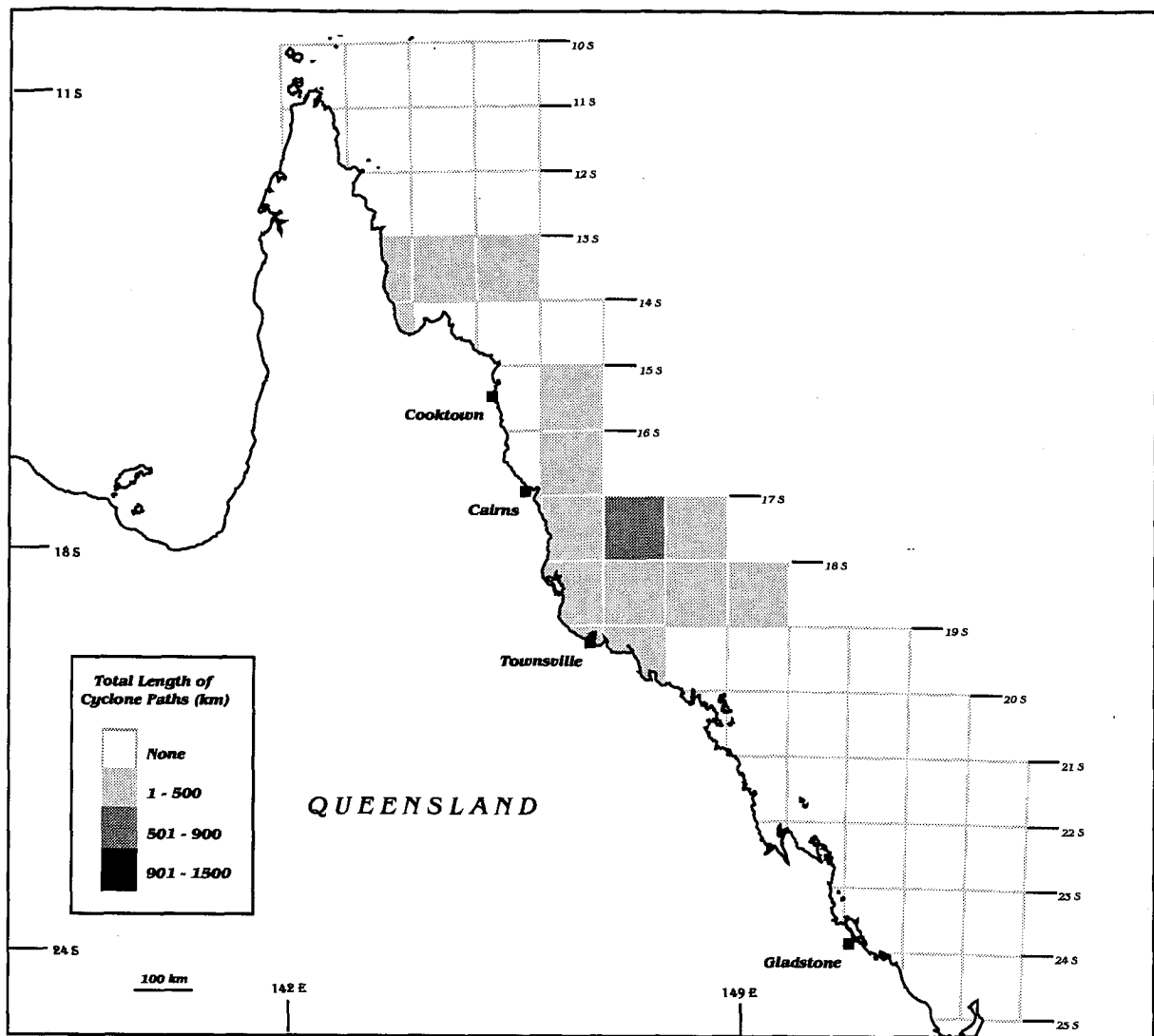
Map 34 : *Number of years before 1997 since the last category 4 cyclone. Boxes classified as 30+ years have had no category 4 cyclones pass through them from 1969 to 1997.*



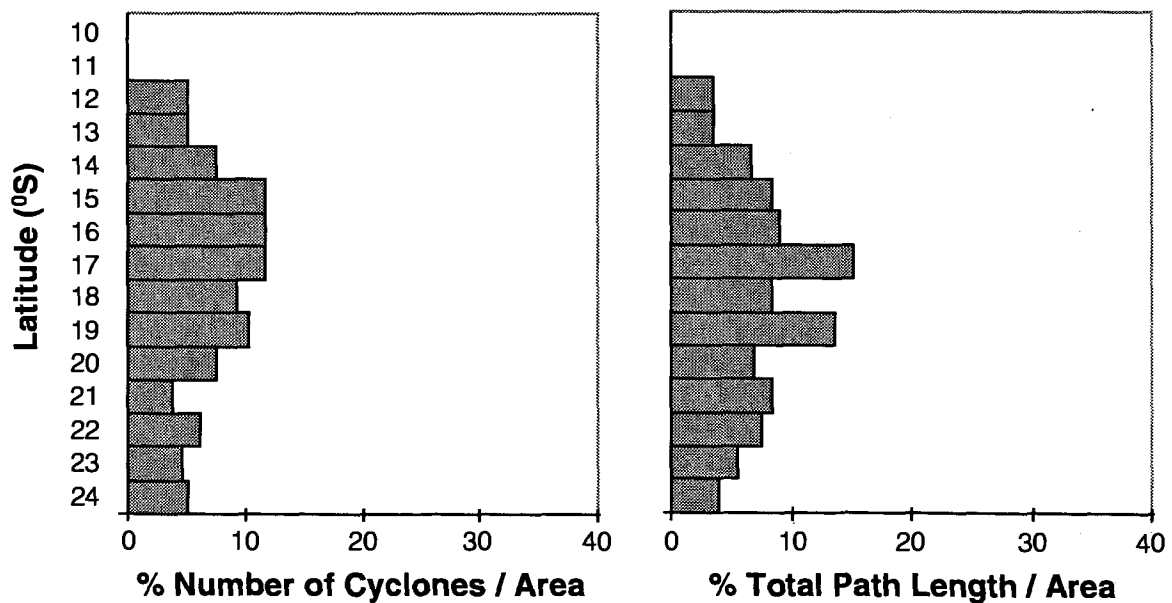
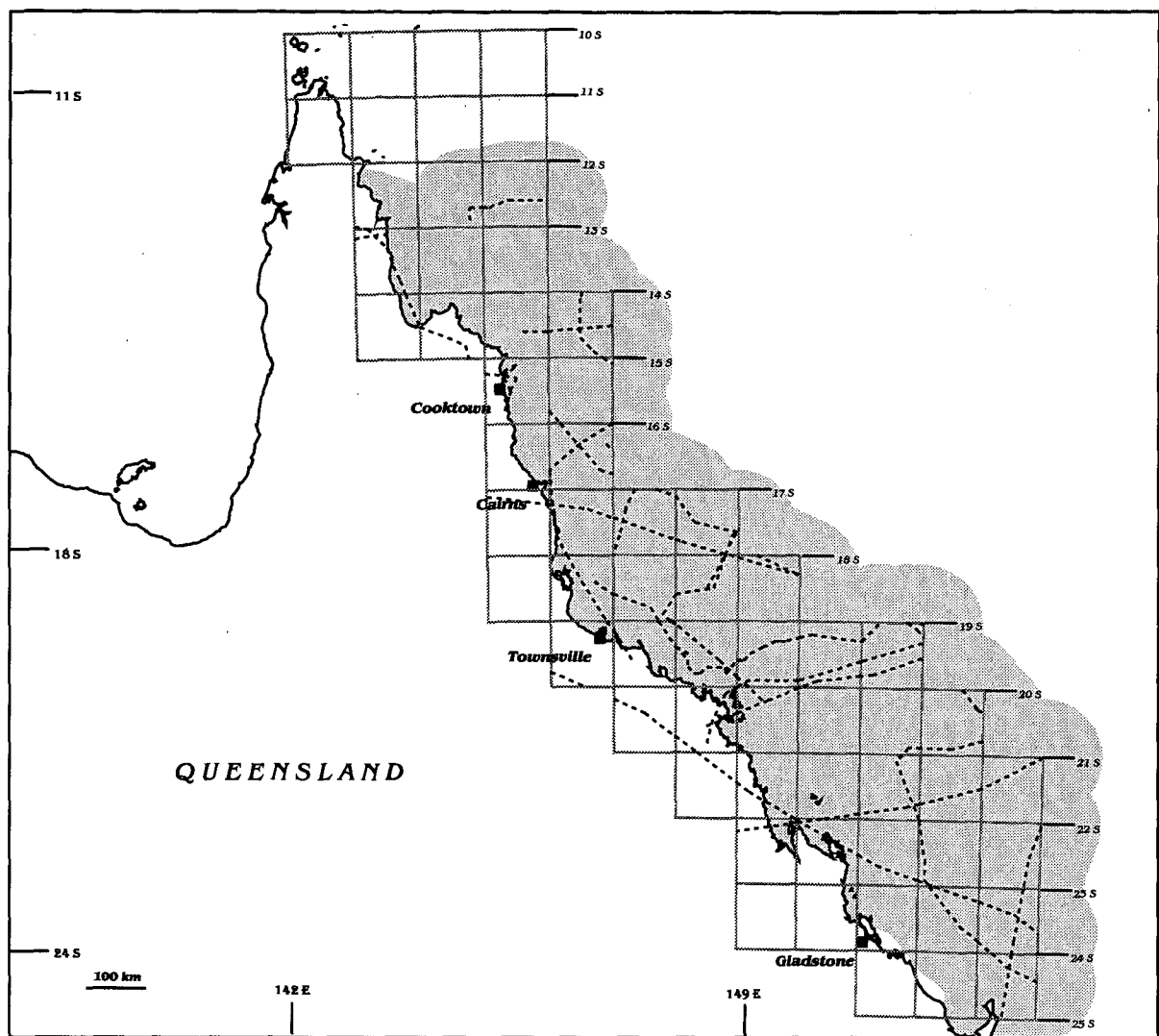
Map 35: *All cyclones in December 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones in December by latitude.*



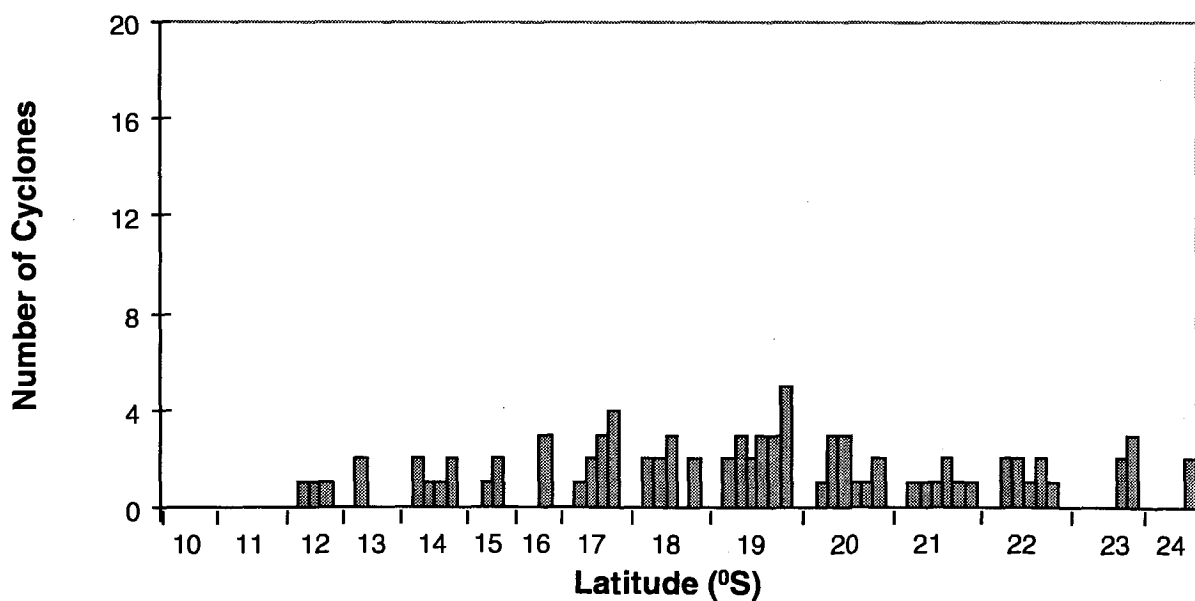
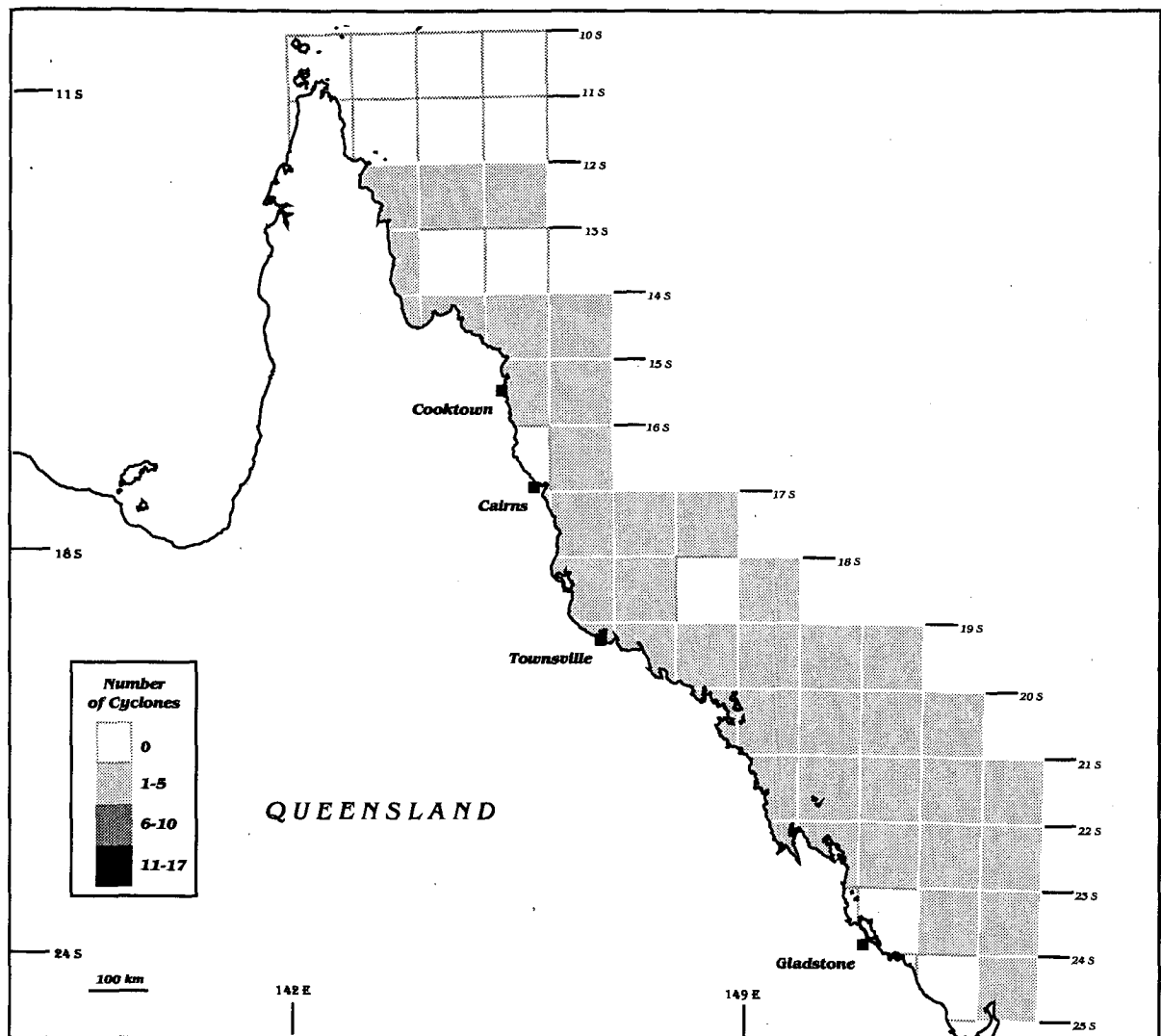
Map 36: *All cyclones in December 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



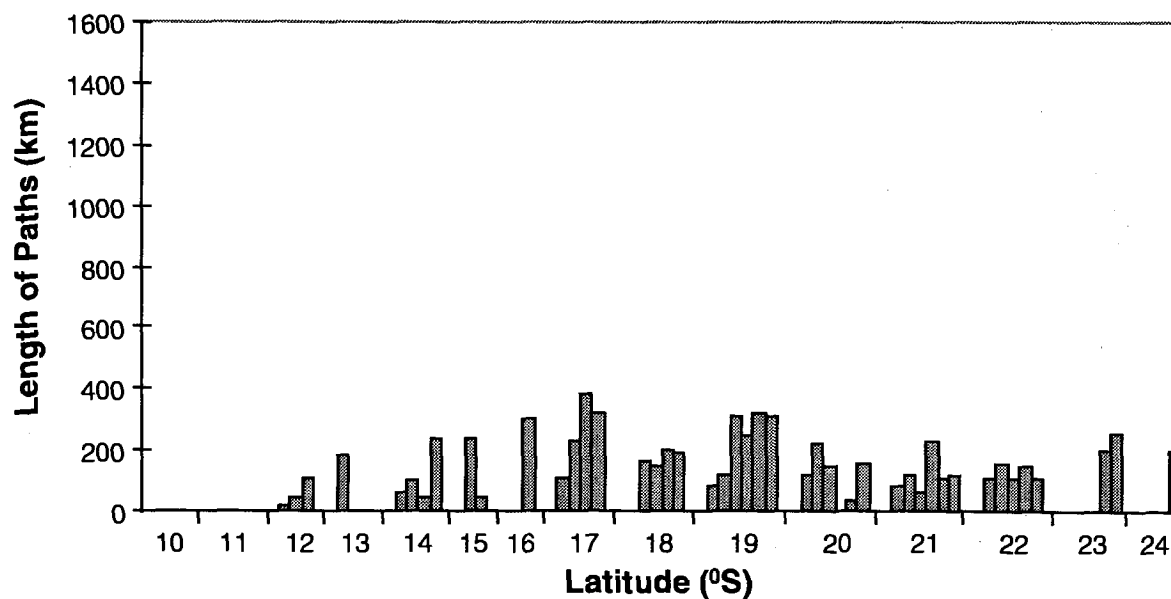
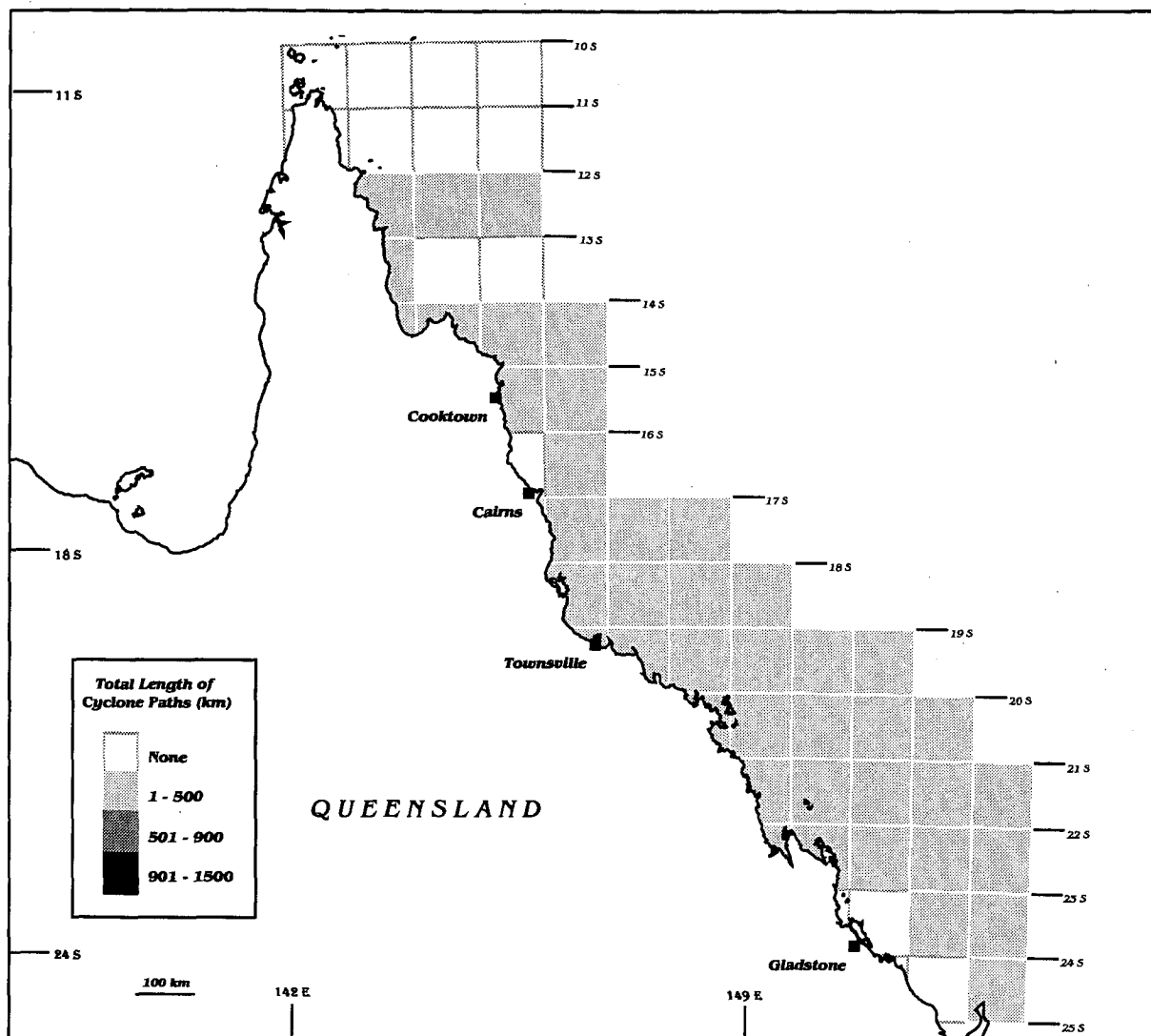
Map 37: *All cyclones in December 1969-1997: total length of cyclone paths. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



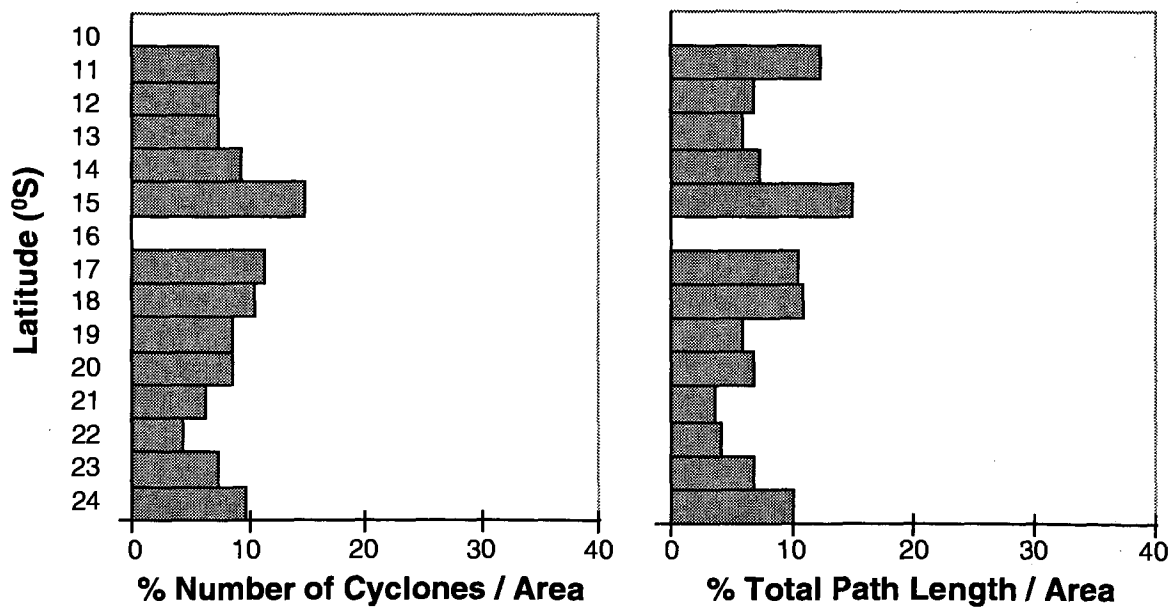
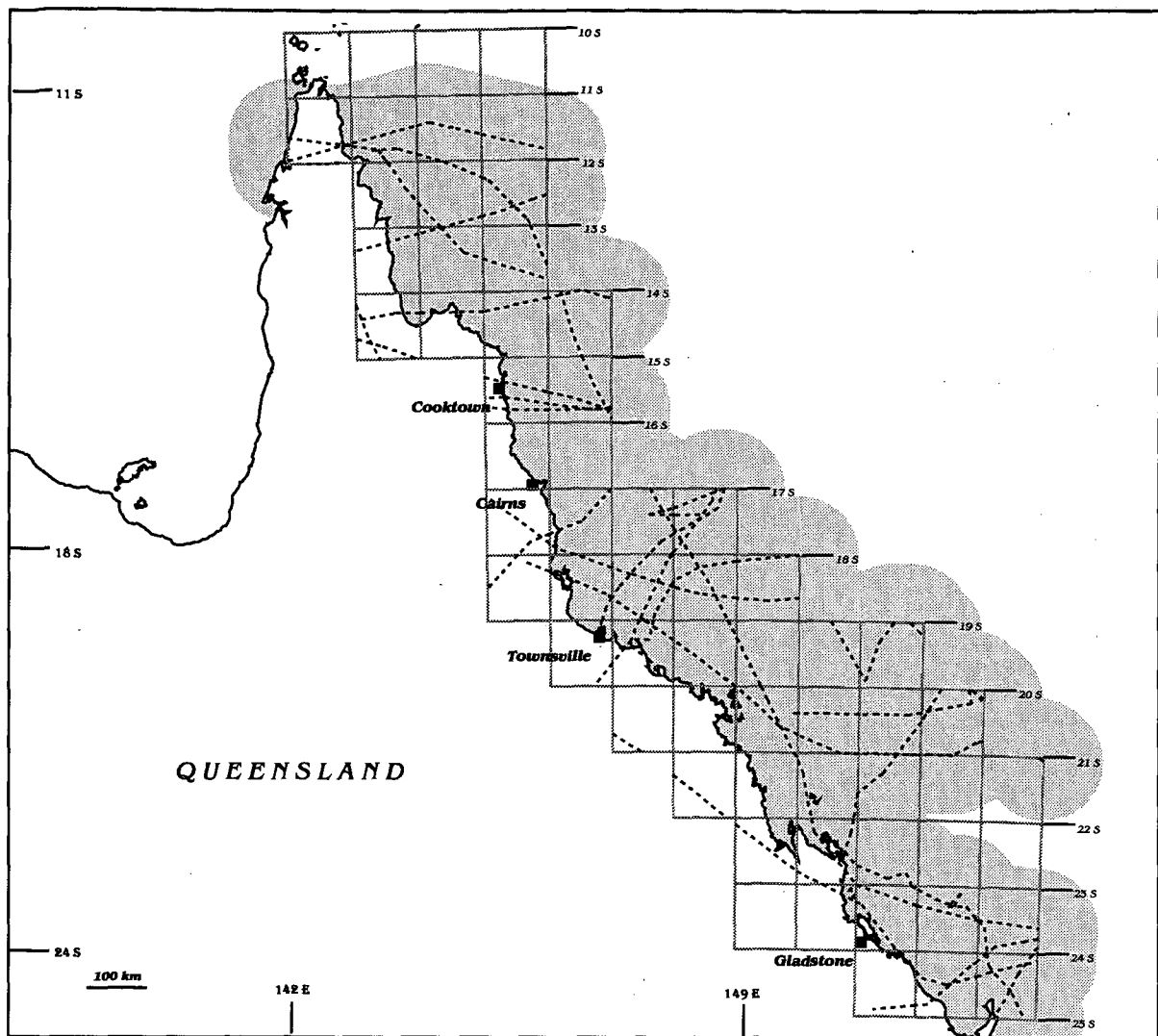
Map 38: *All cyclones in January 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones in January by latitude.*



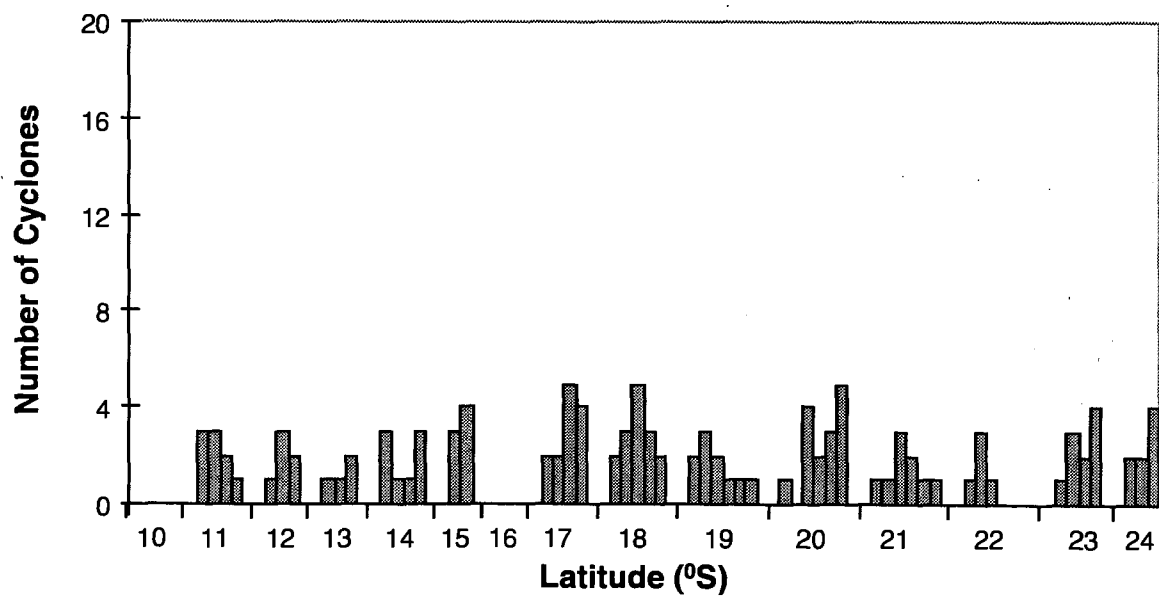
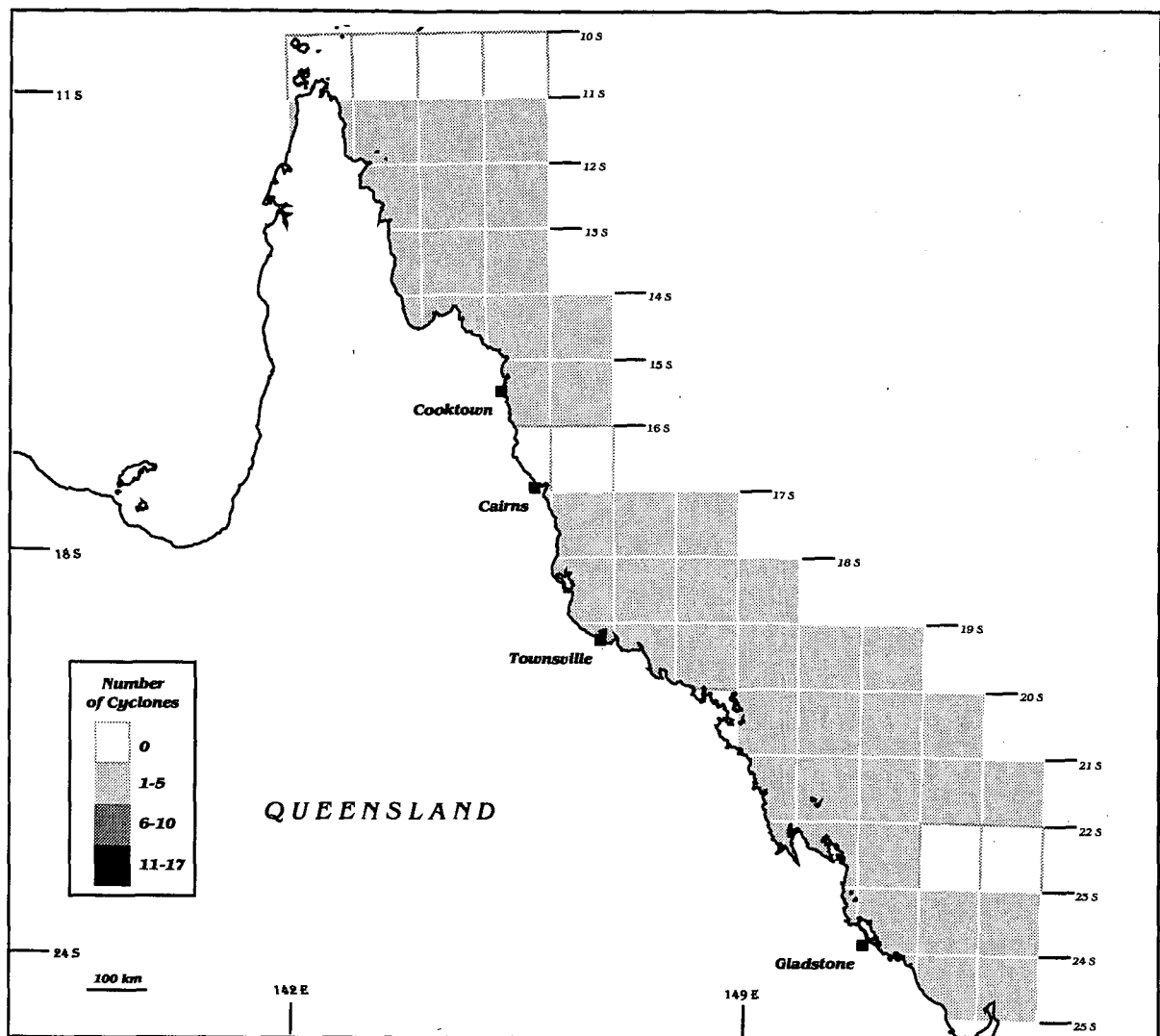
Map 39: *All cyclones in January 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



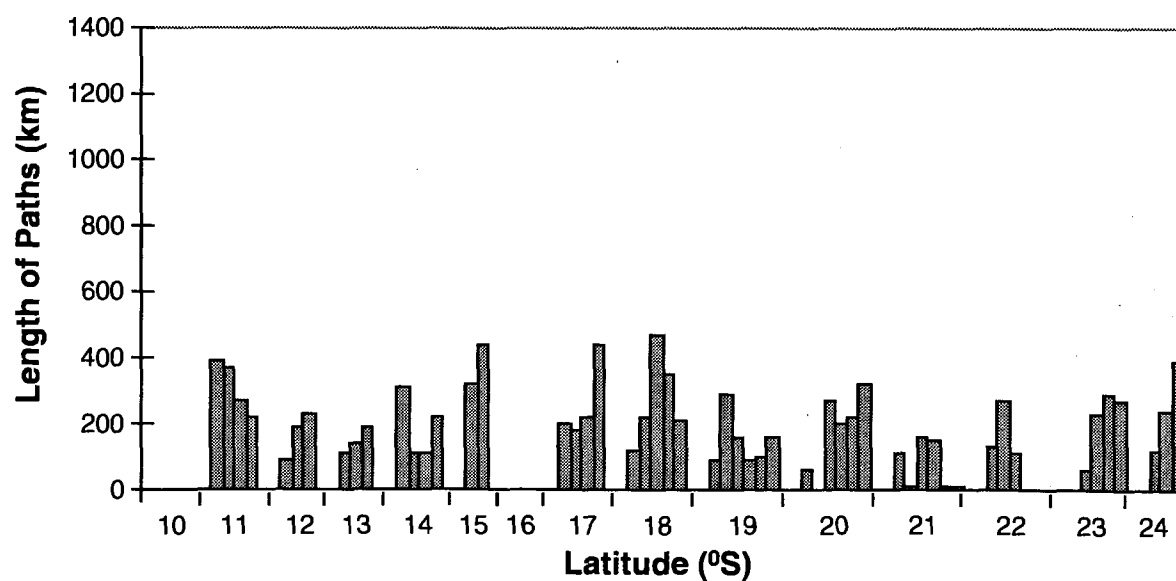
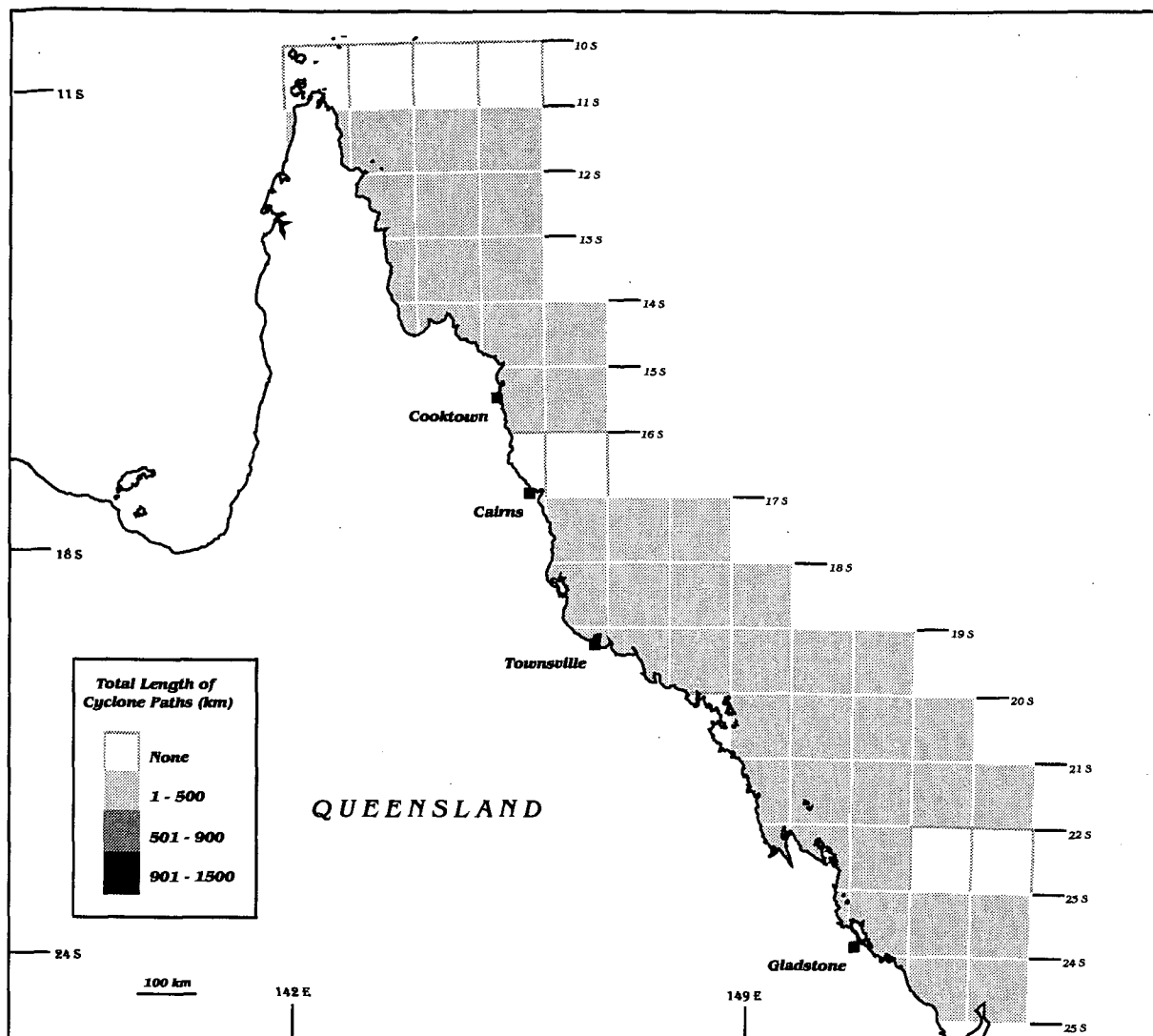
Map 40: *All cyclones in January 1969-1997: total length of cyclone paths. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



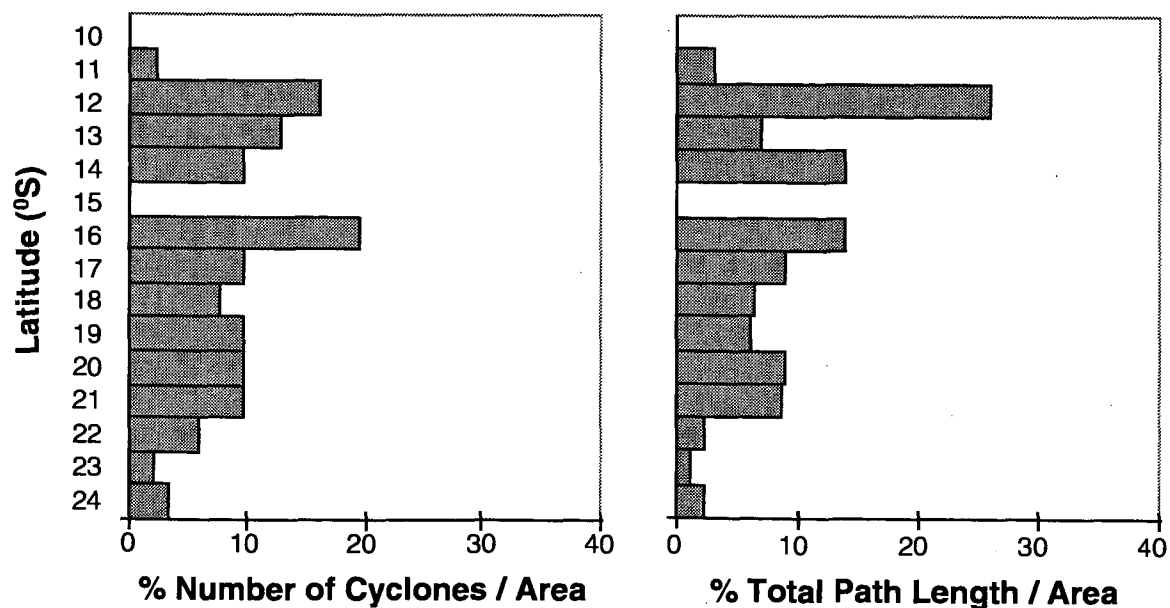
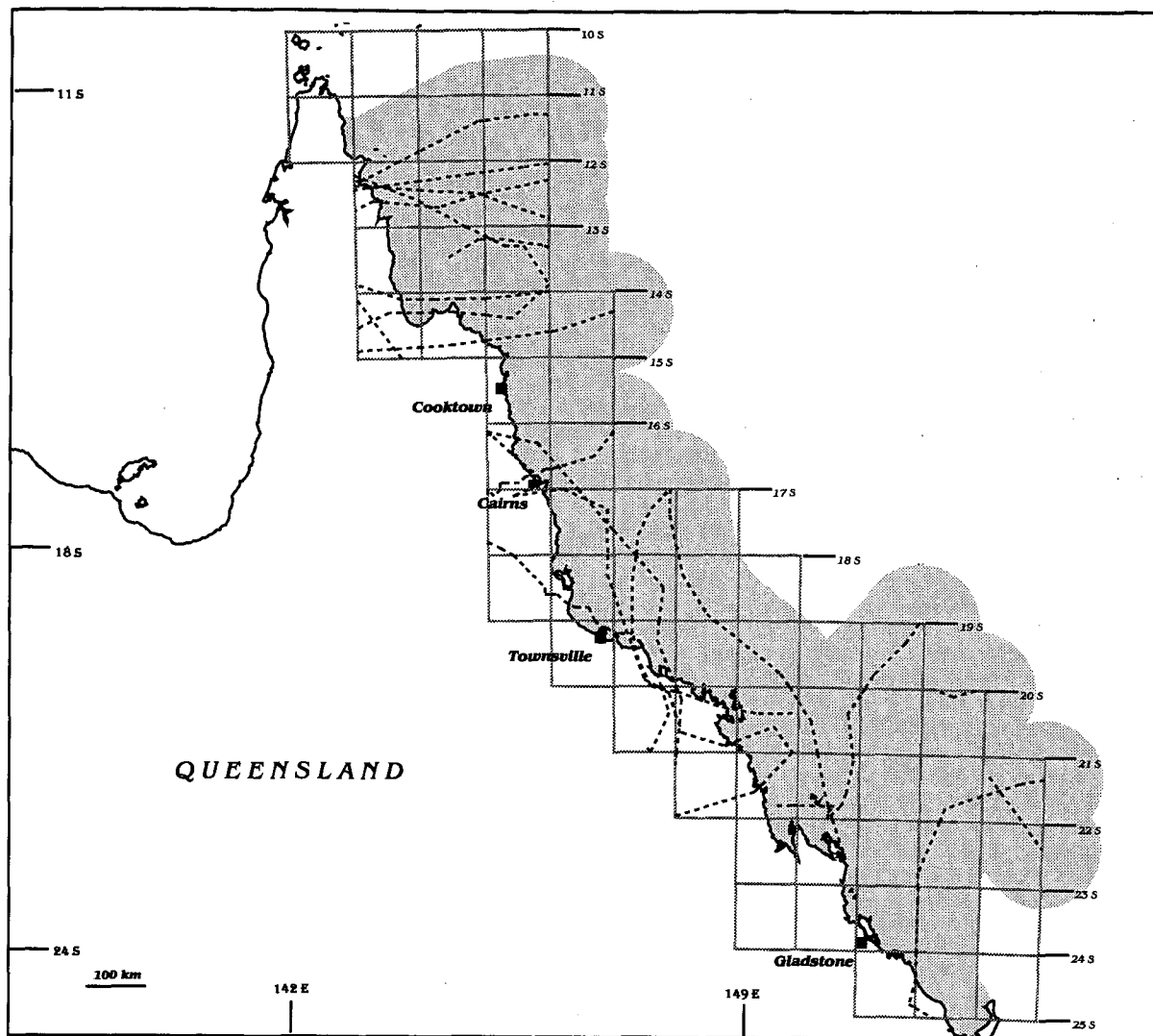
Map 41: *All cyclones in February 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones in February by latitude.*



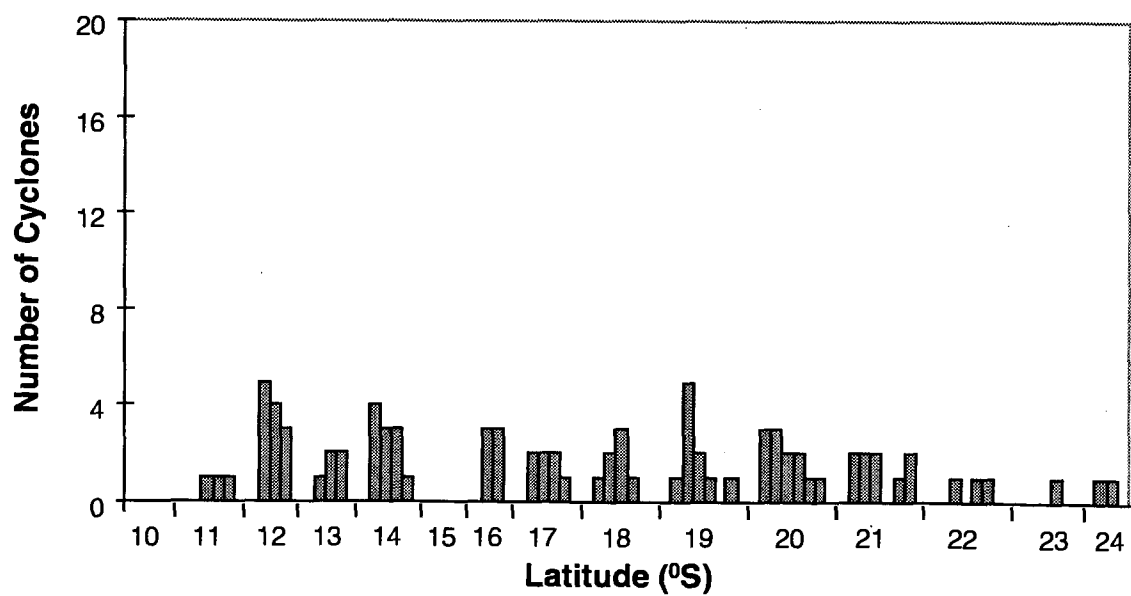
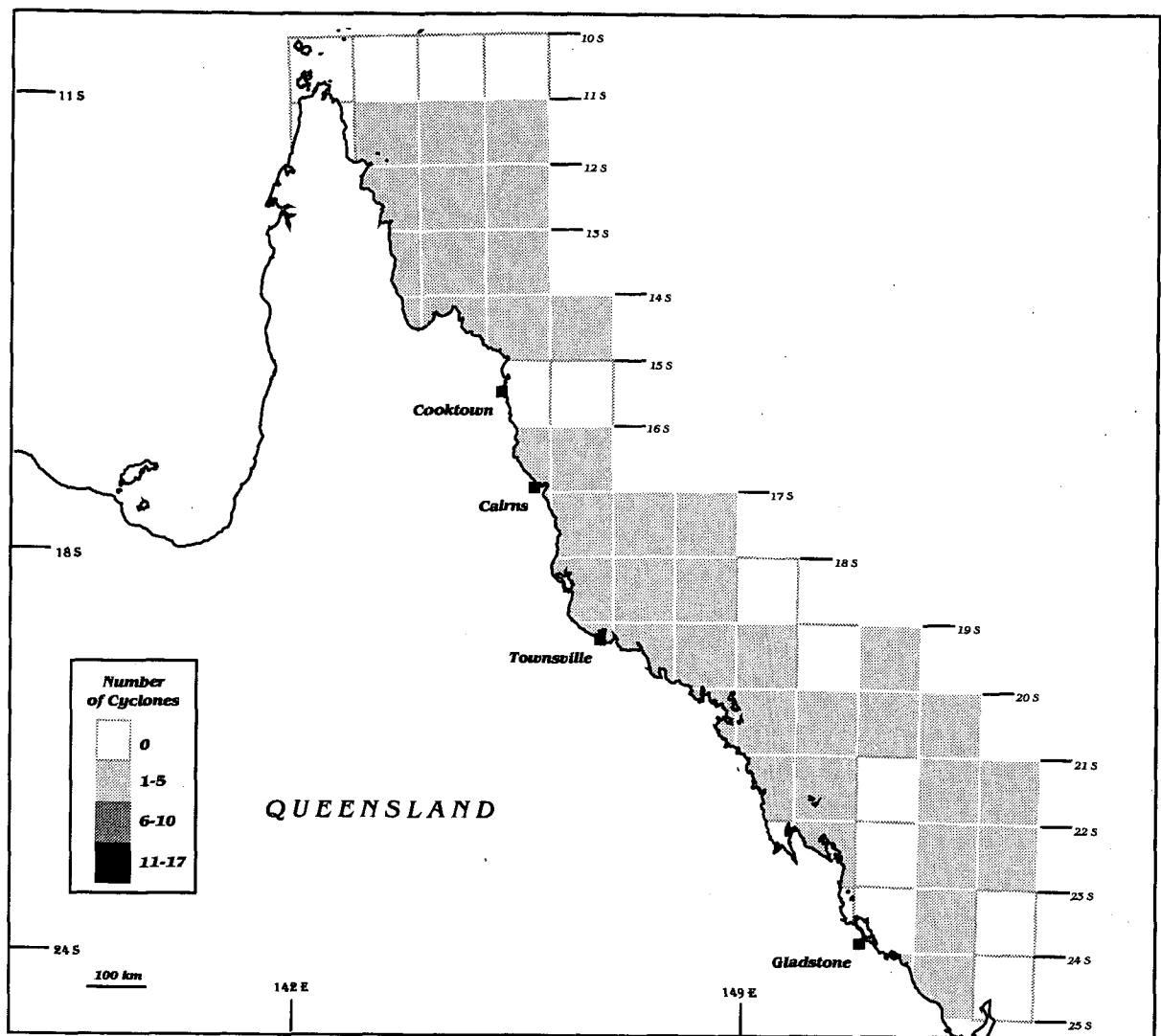
Map 42: All cyclones in February 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.



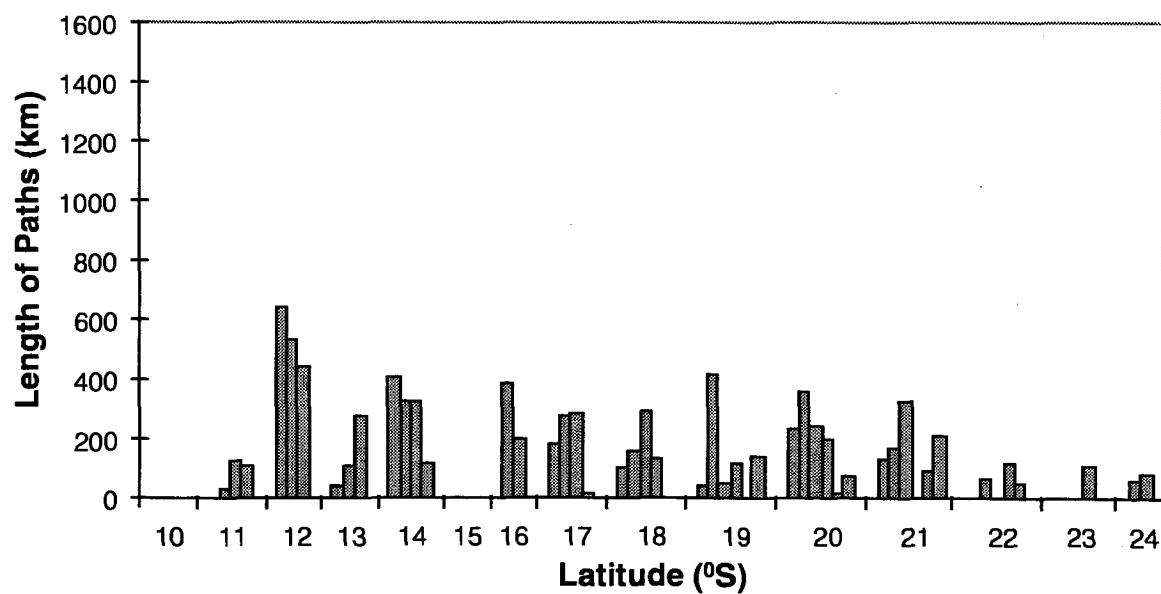
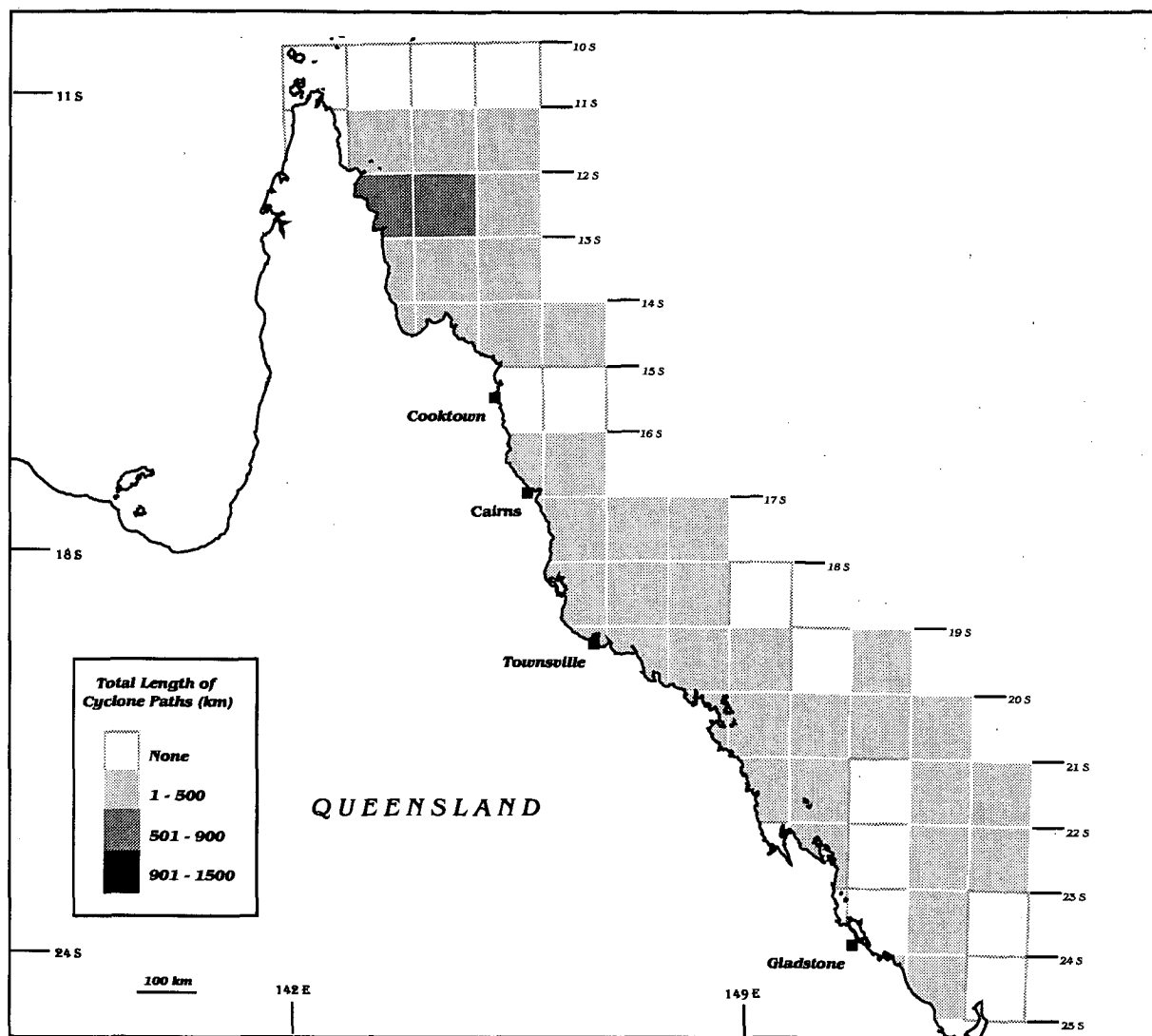
Map 43: *All cyclones in February 1969-1997: total length of cyclone paths. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



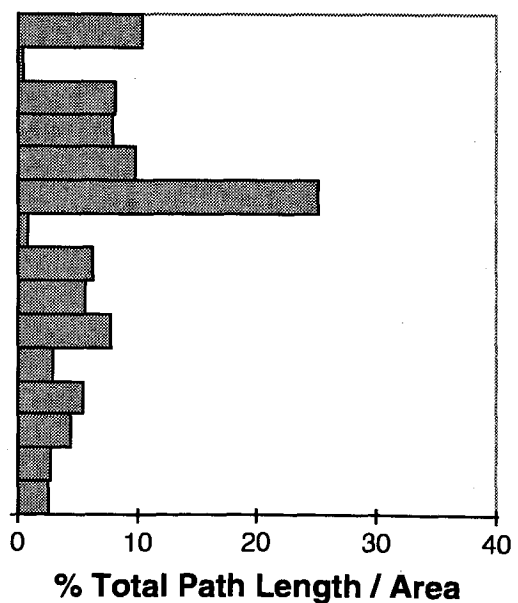
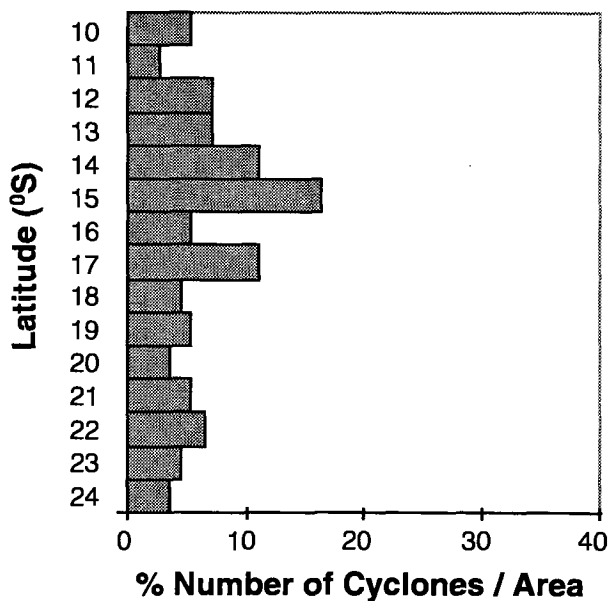
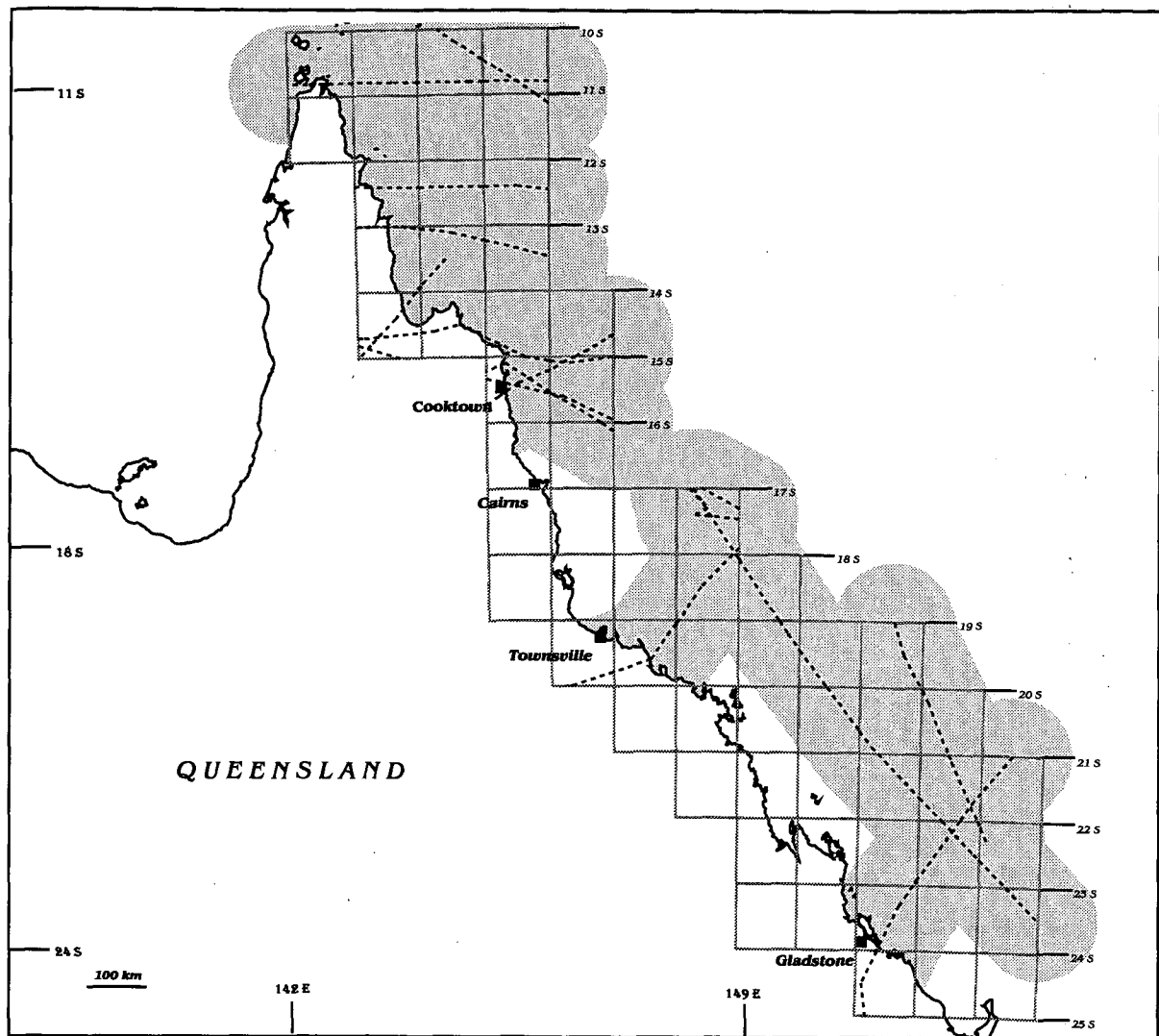
Map 44: *All cyclones in March 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones in March by latitude.*



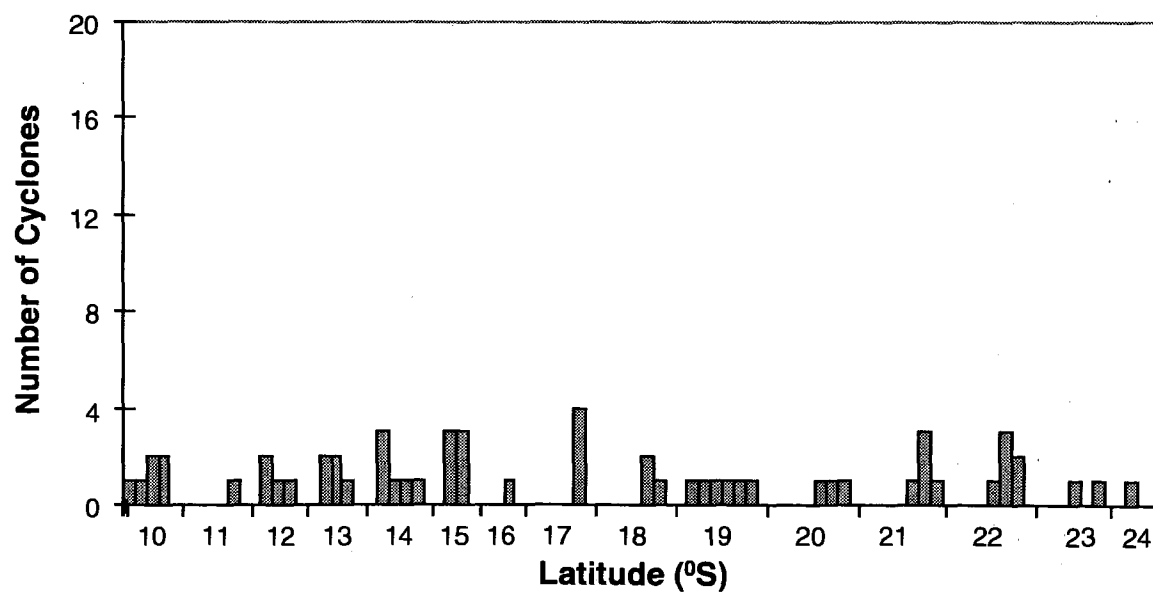
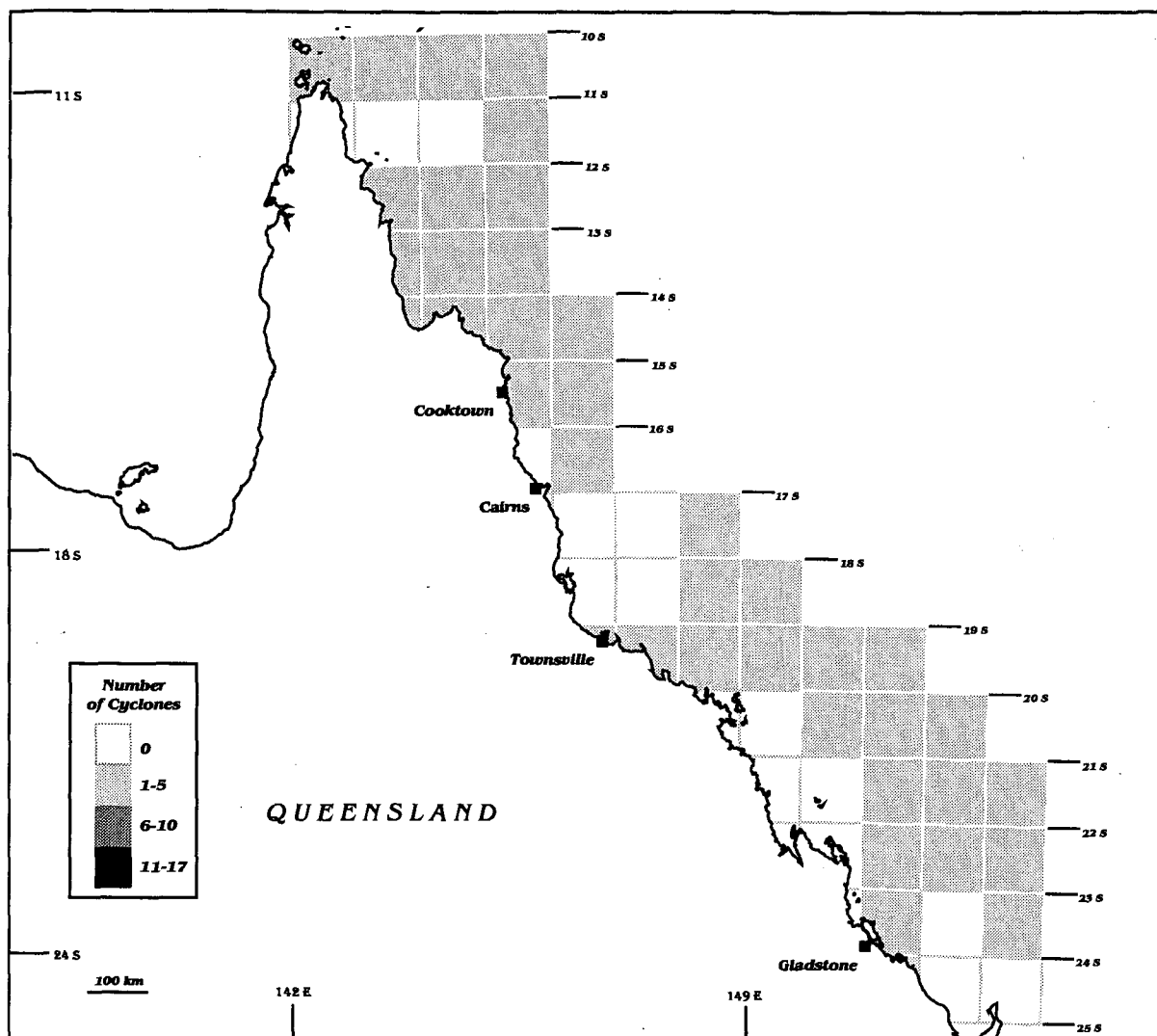
Map 45: *All cyclones in March 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



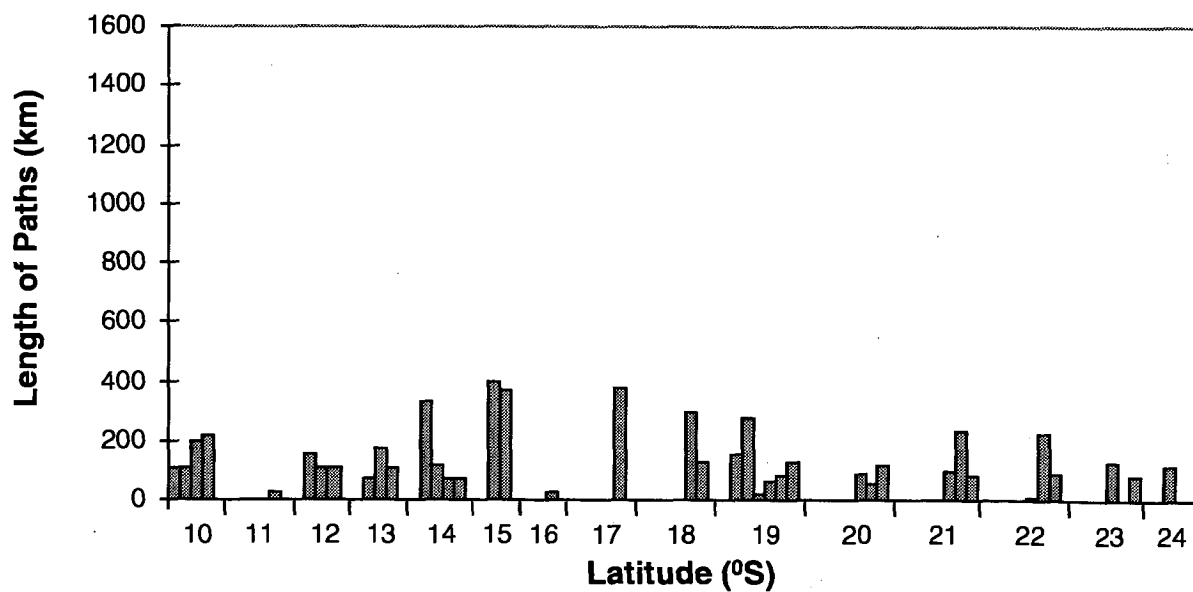
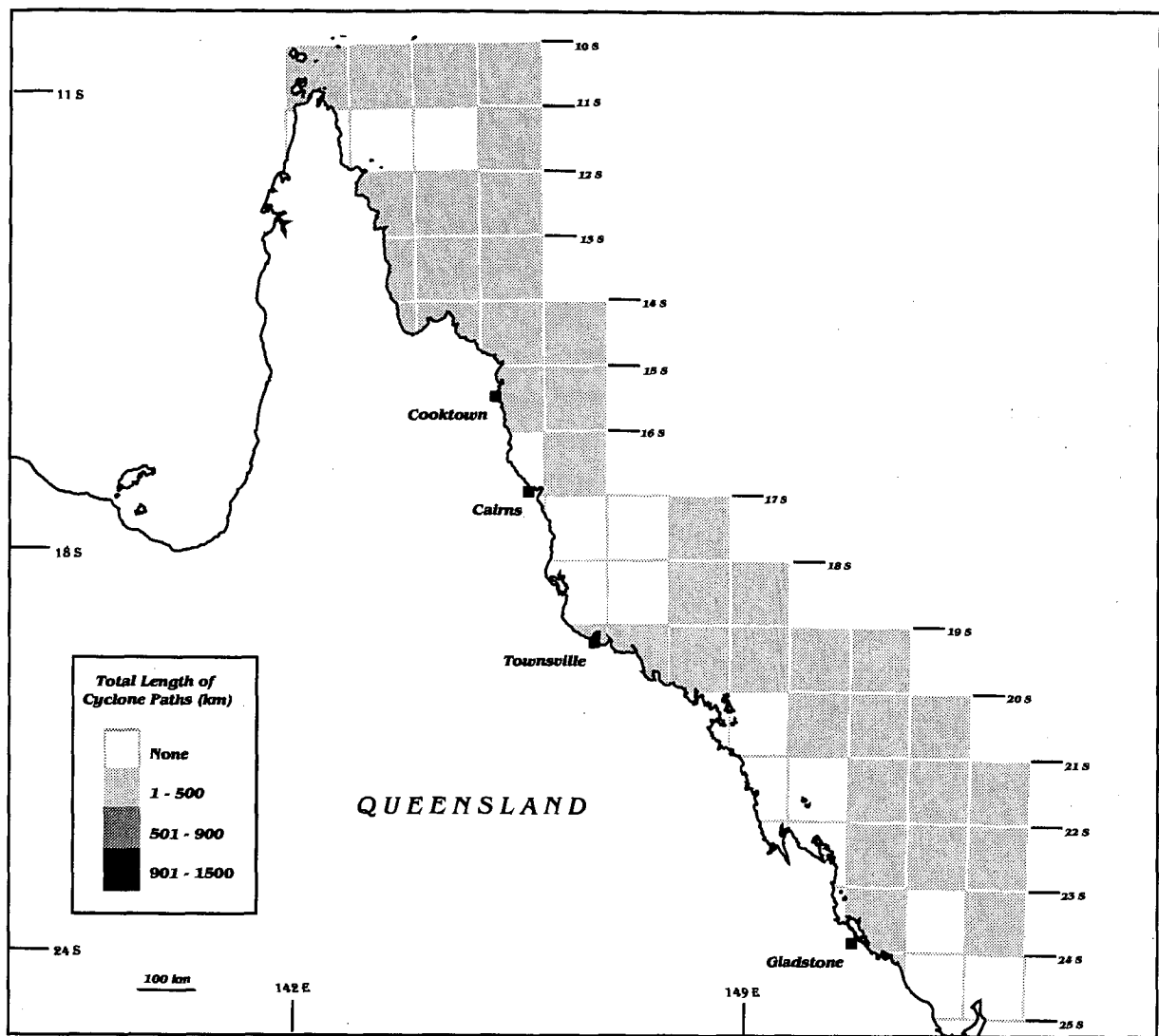
Map 46: *All cyclones in March 1969-1997: total length of cyclone paths. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



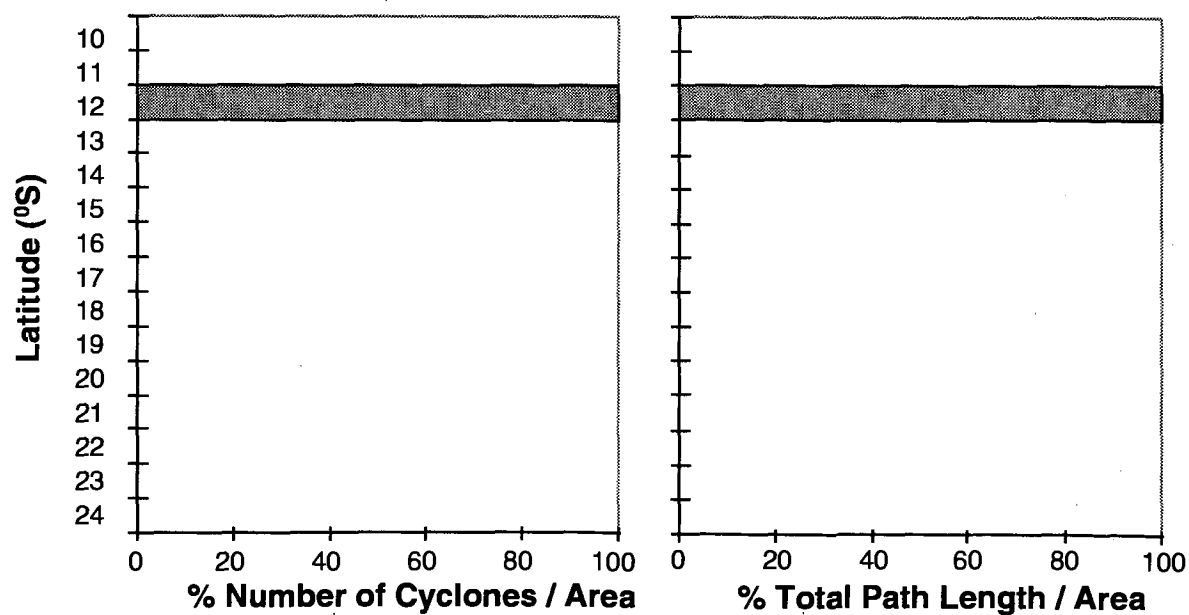
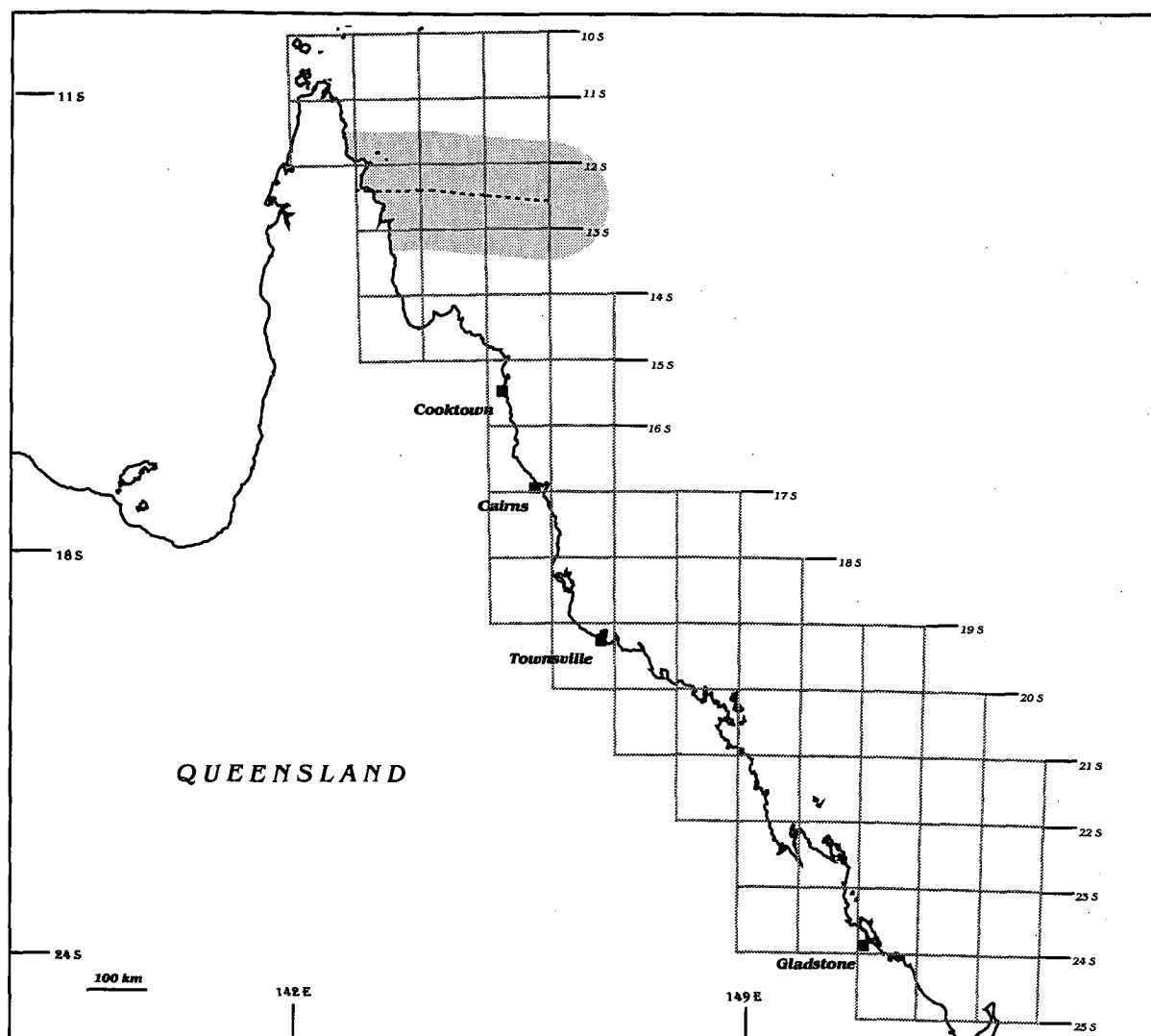
Map 47: *All cyclones in April 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones in April by latitude.*



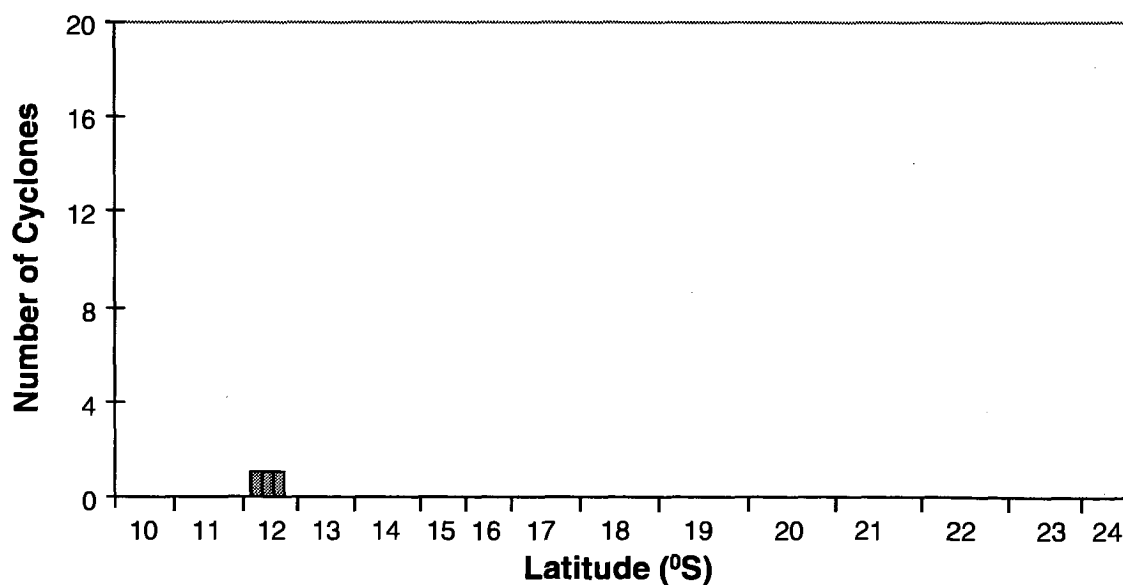
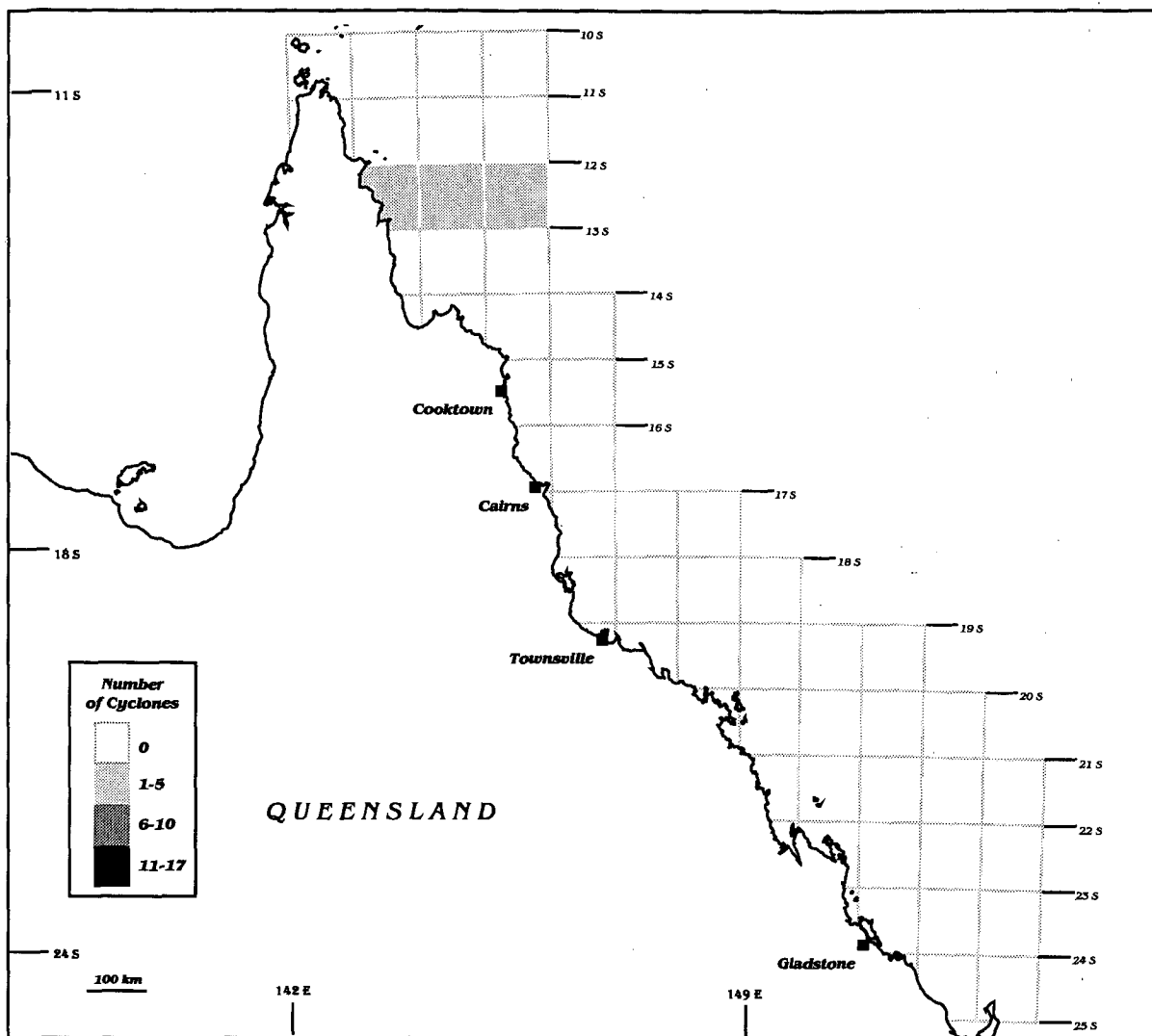
Map 48: *All cyclones in April 1969-1997: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



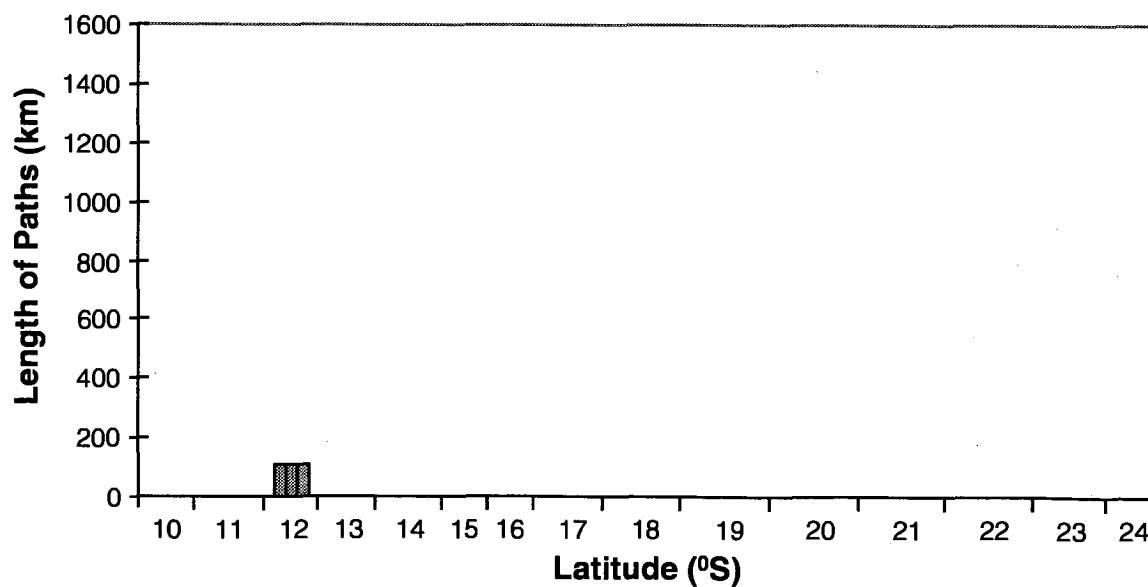
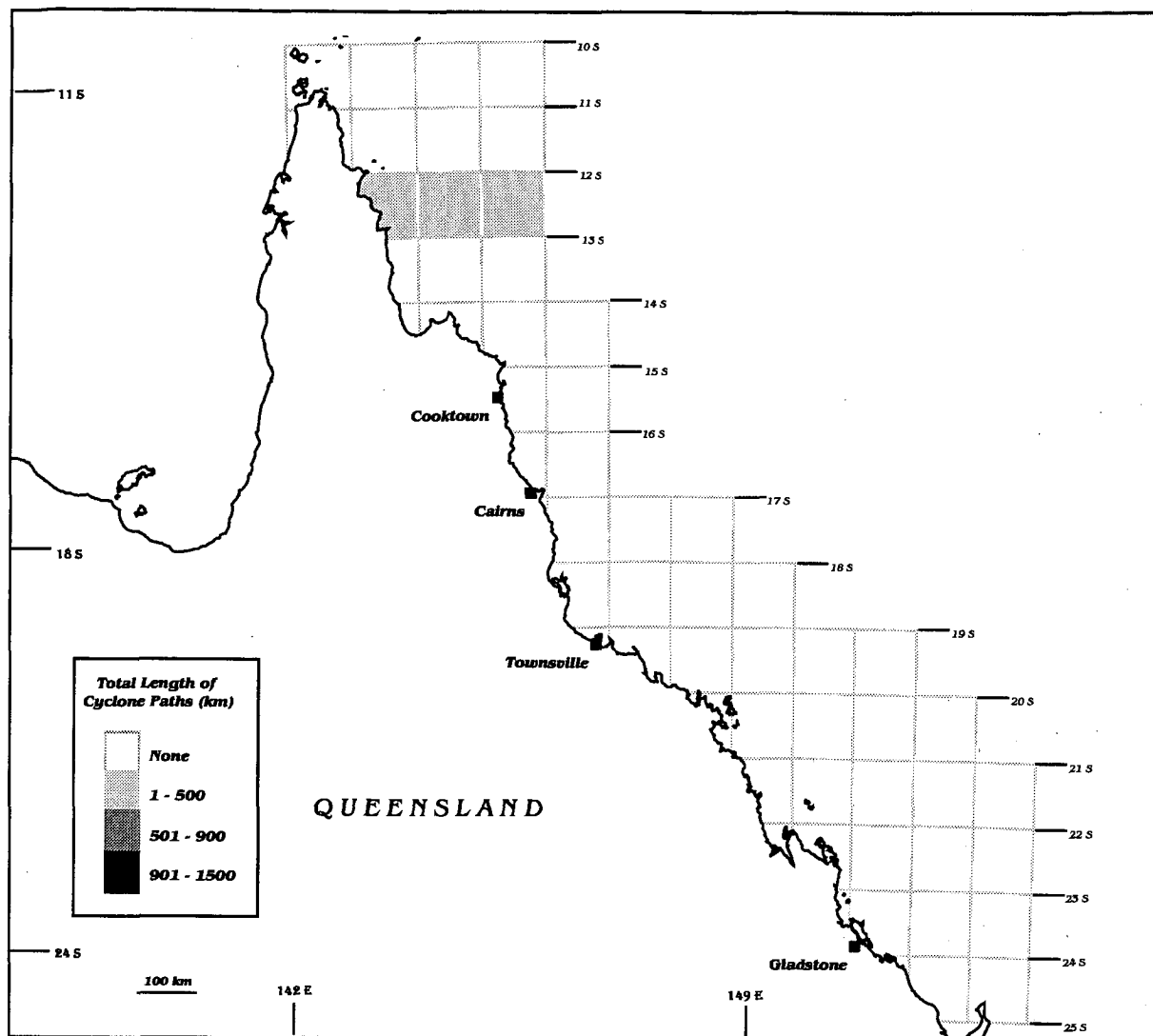
Map 49: *All cyclones in April 1969-1997: total length of cyclone paths. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



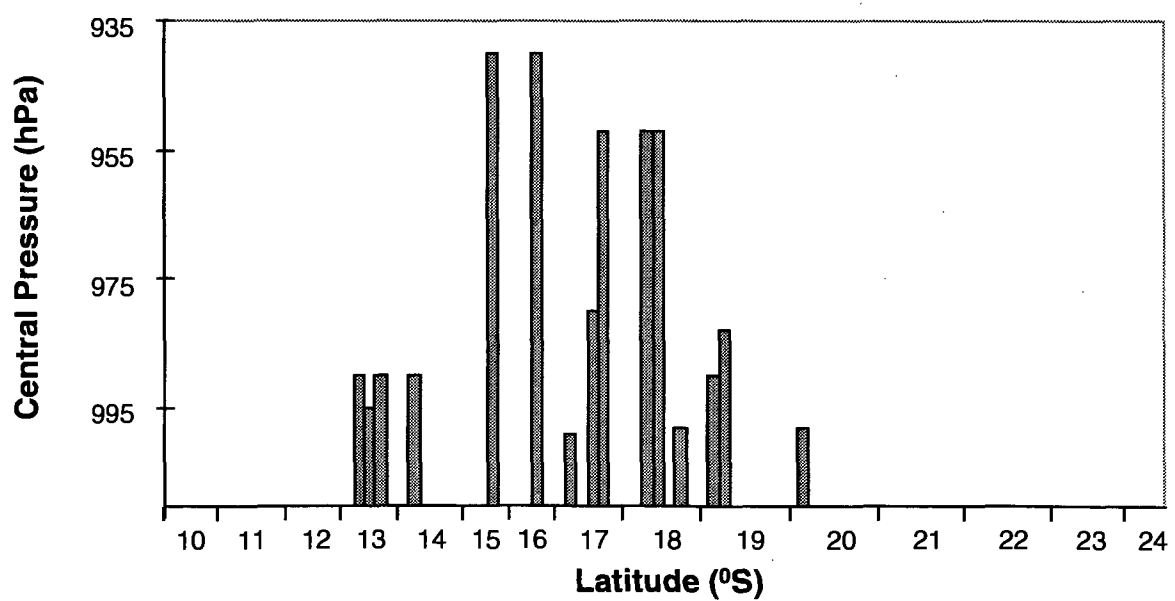
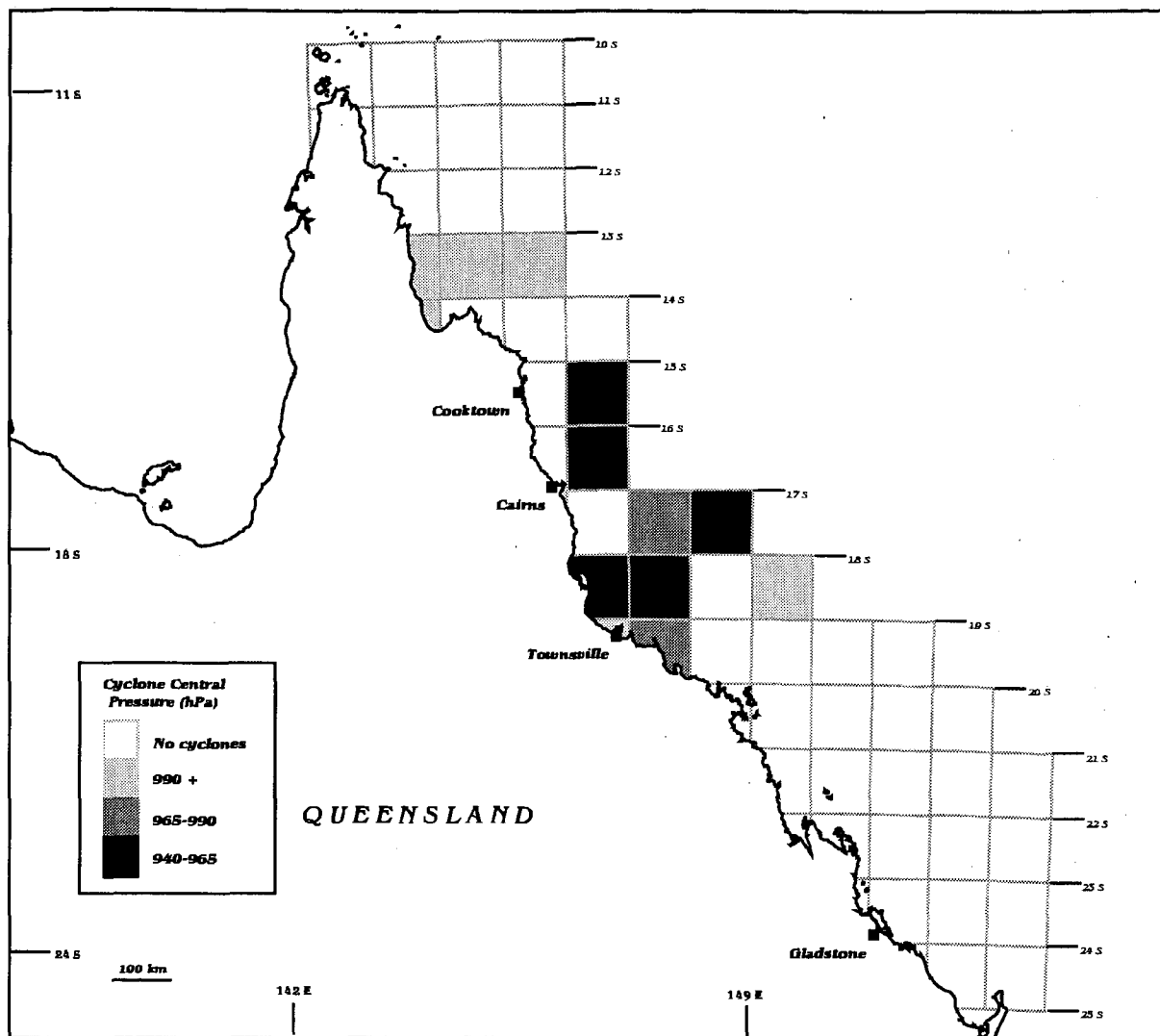
Map 50: All cyclones in May 1969-1997. Dashed lines represent cyclone paths and shading indicates areas within 100 km of at least one path. The graphs indicate peaks in the number and total path length of all cyclones in May by latitude.



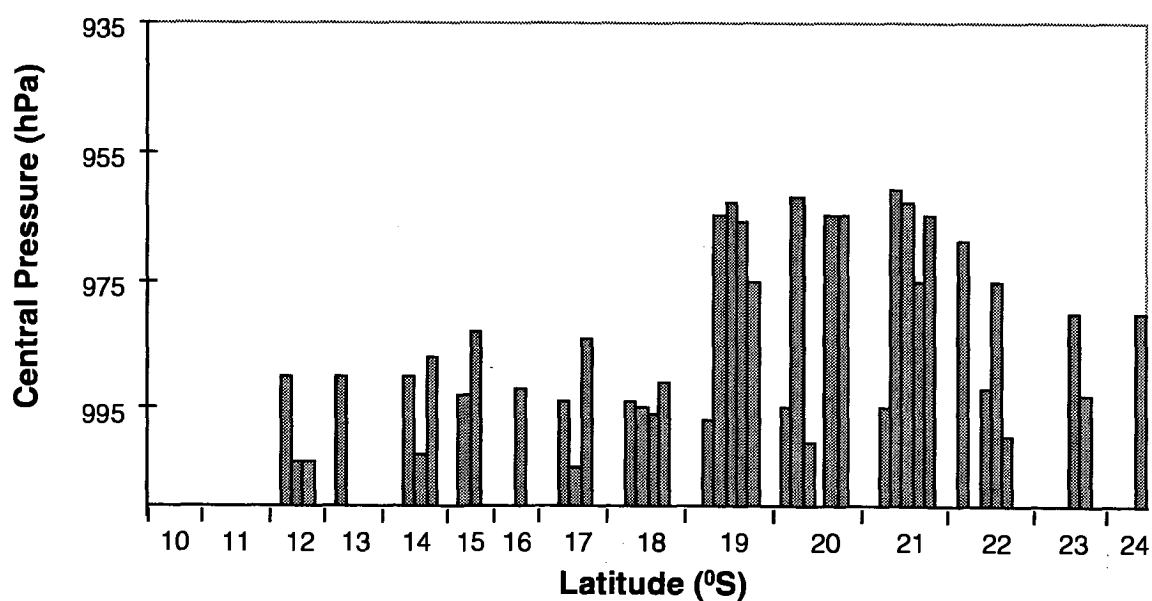
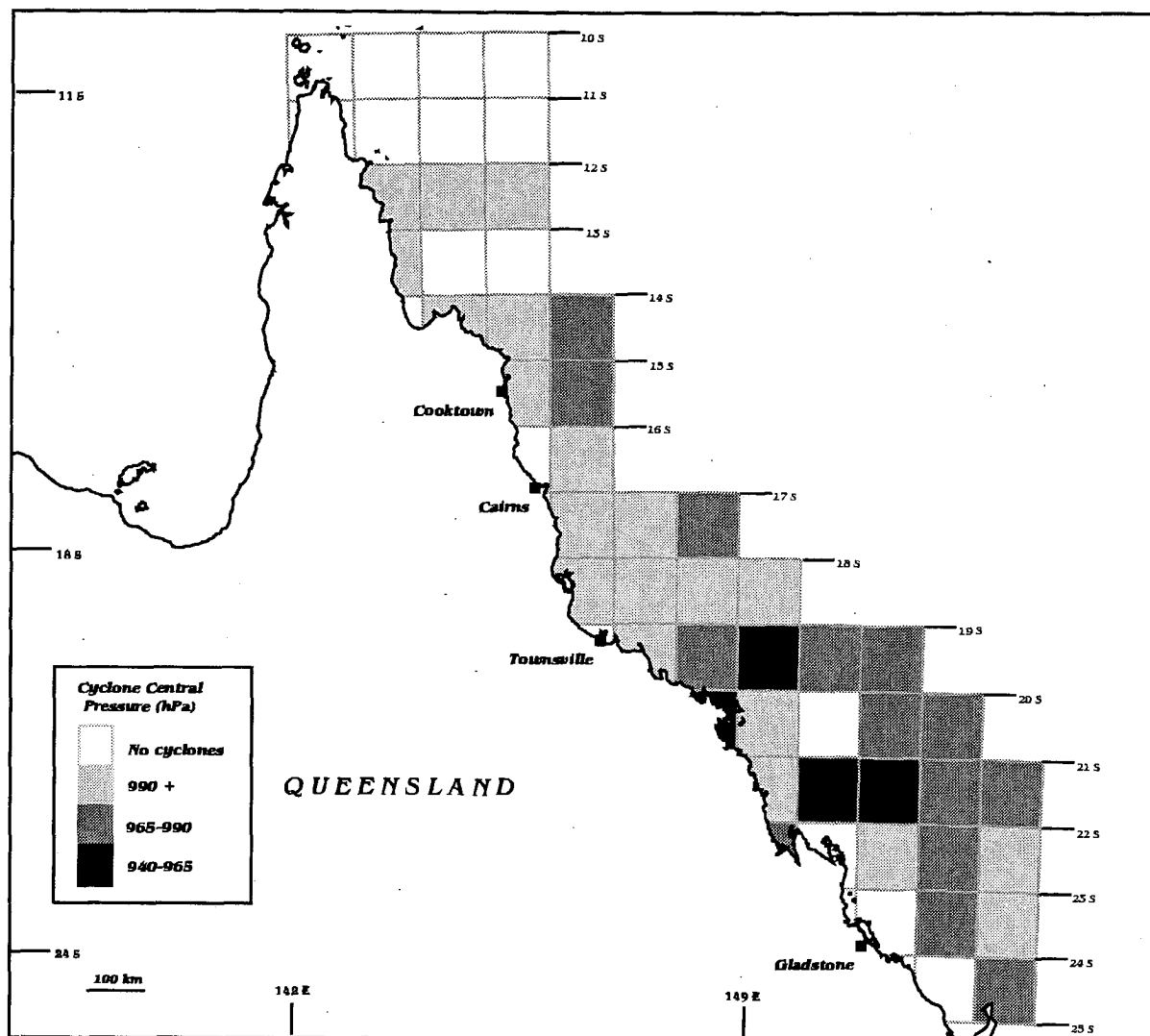
Map 51: *All cyclones in May 1969-1976: number of cyclones. Seperate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



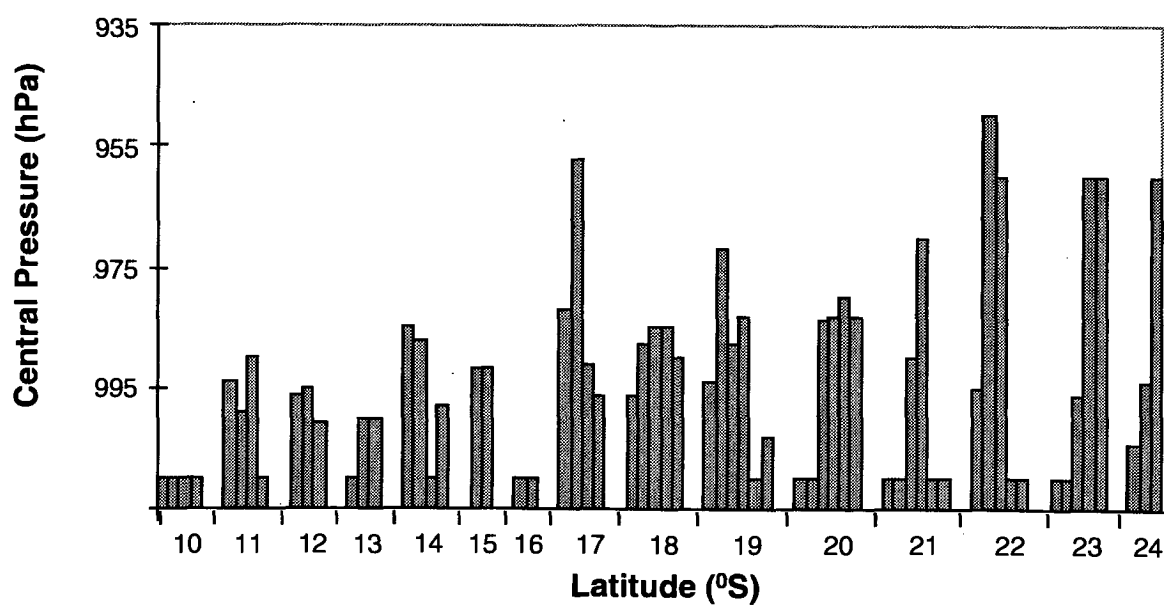
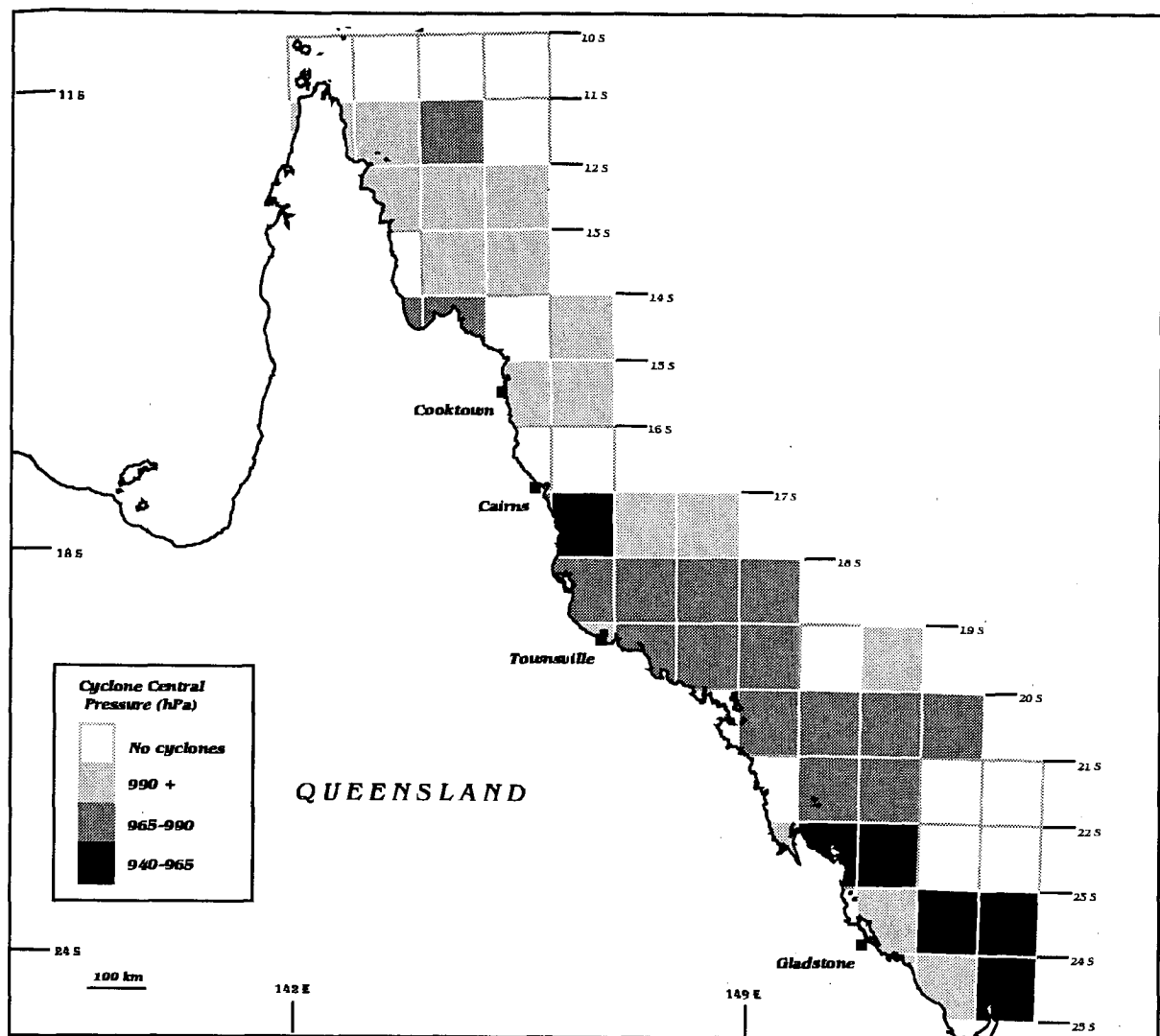
Map 52: *All cyclones in May 1969-1997: total length of cyclone paths. Separate bars for each latitude depict the values for each 1° latitude by 1° longitude box.*



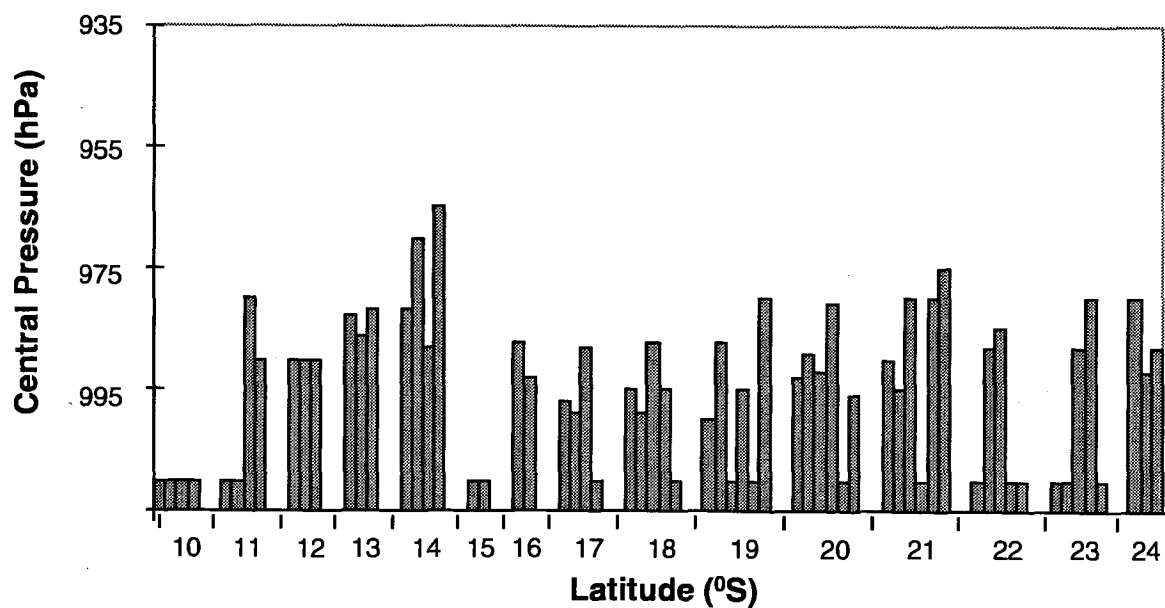
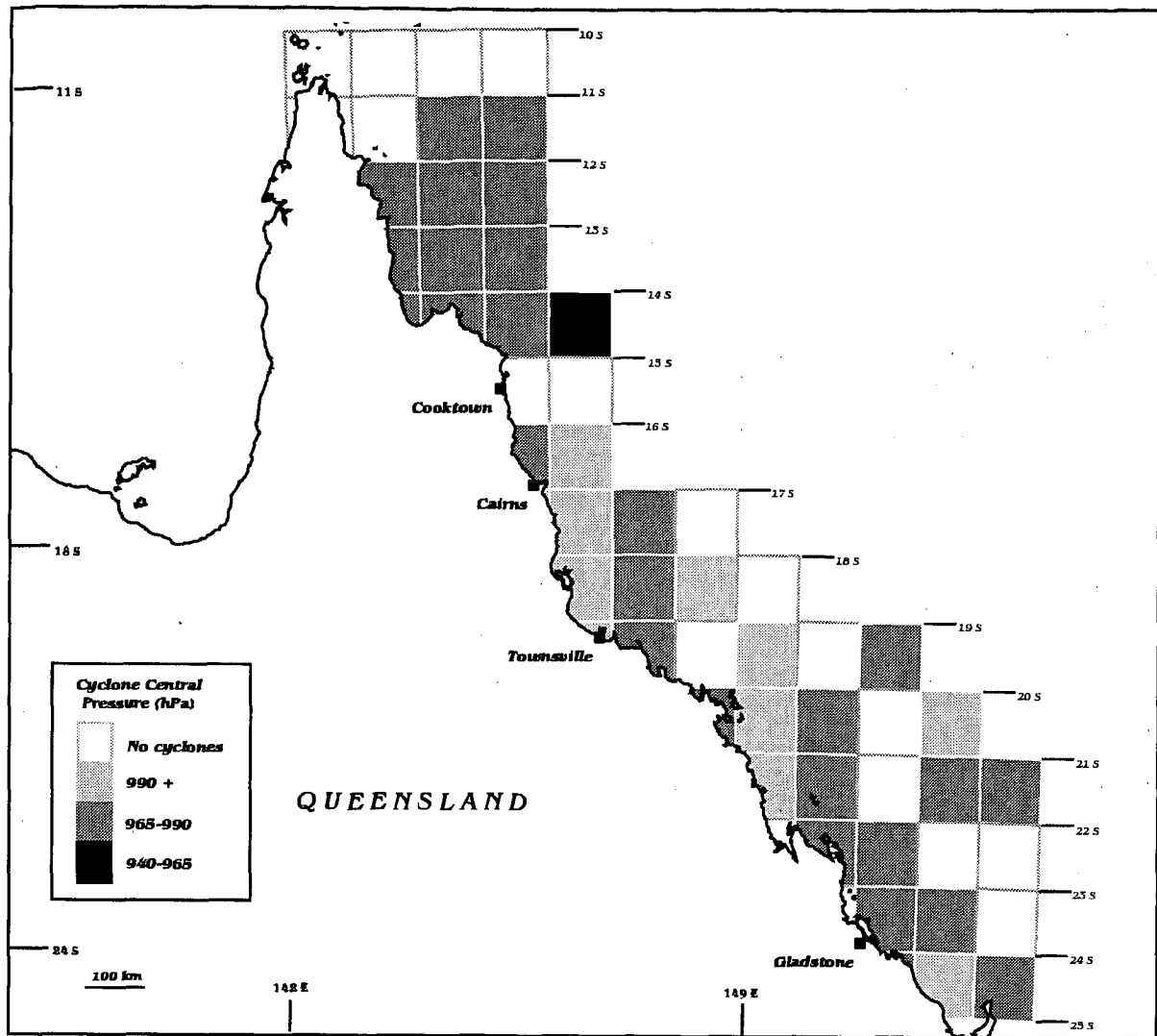
Map 54: *Minimum central pressures recorded in December in the GBR Region 1969-1997.*



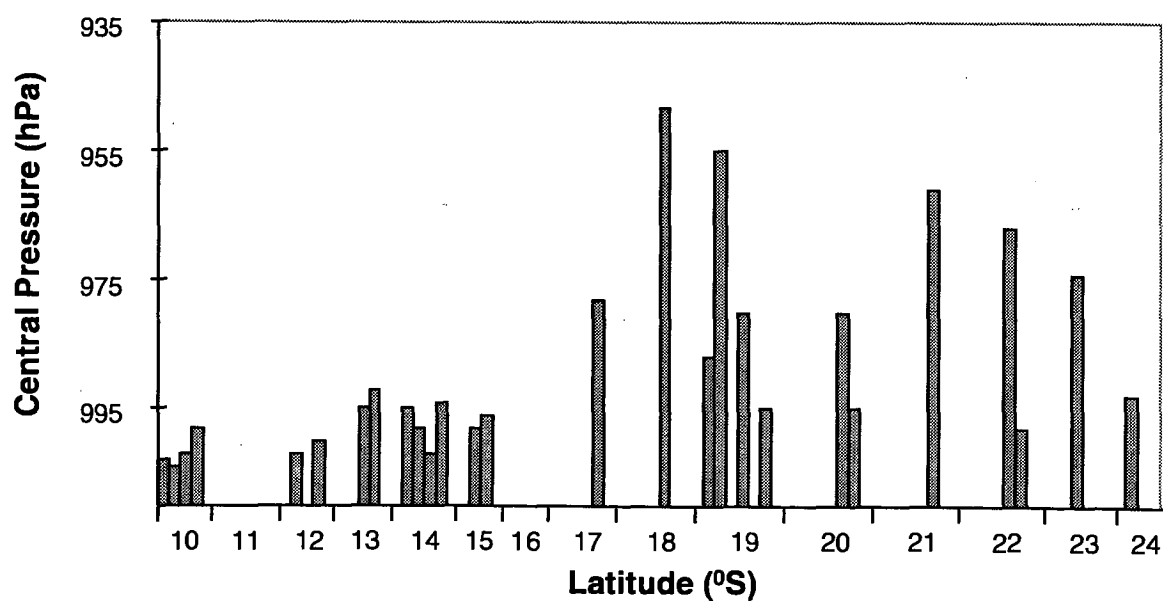
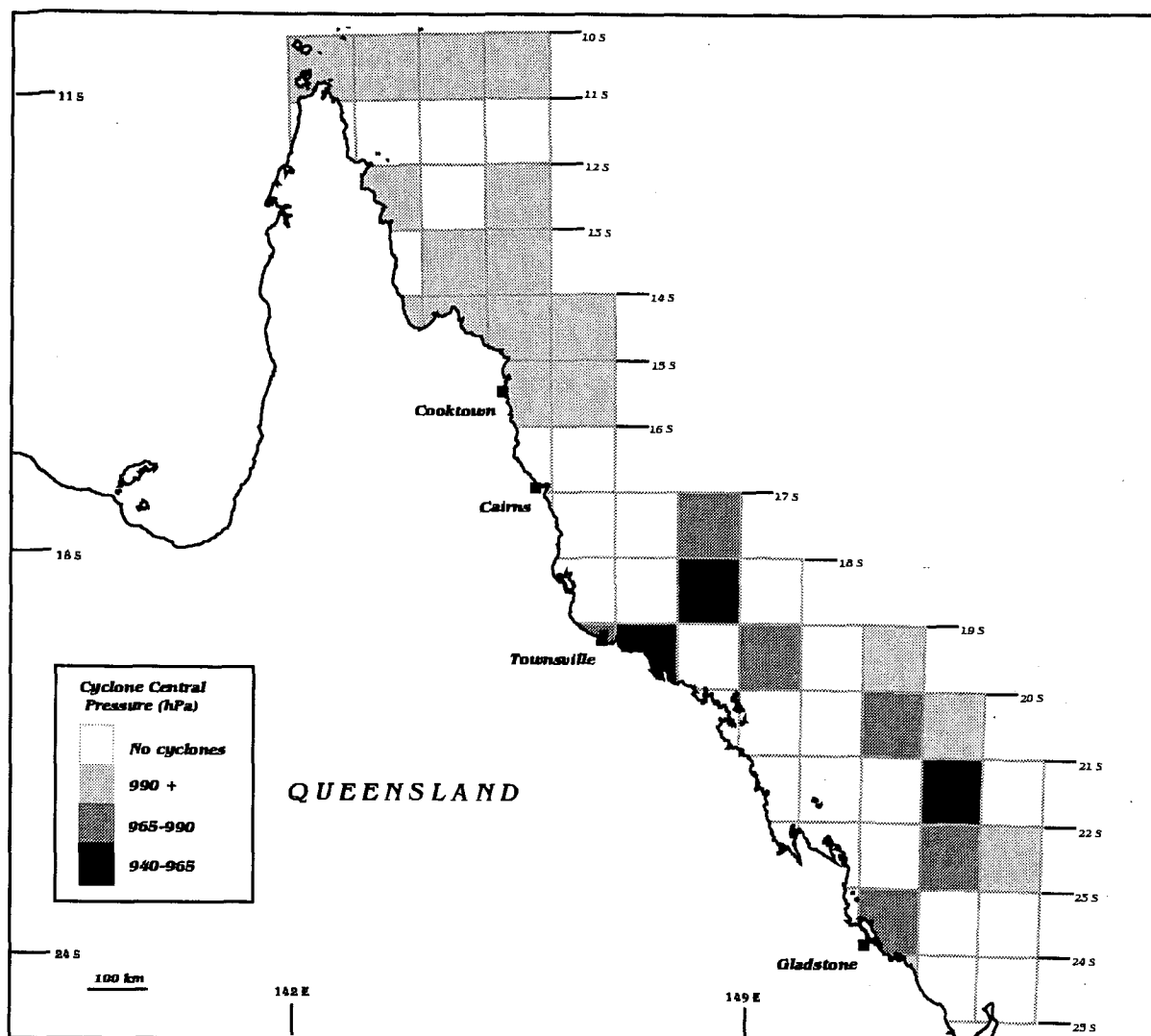
Map 55: Minimum central pressures recorded in January in the GBR Region 1969-1997.



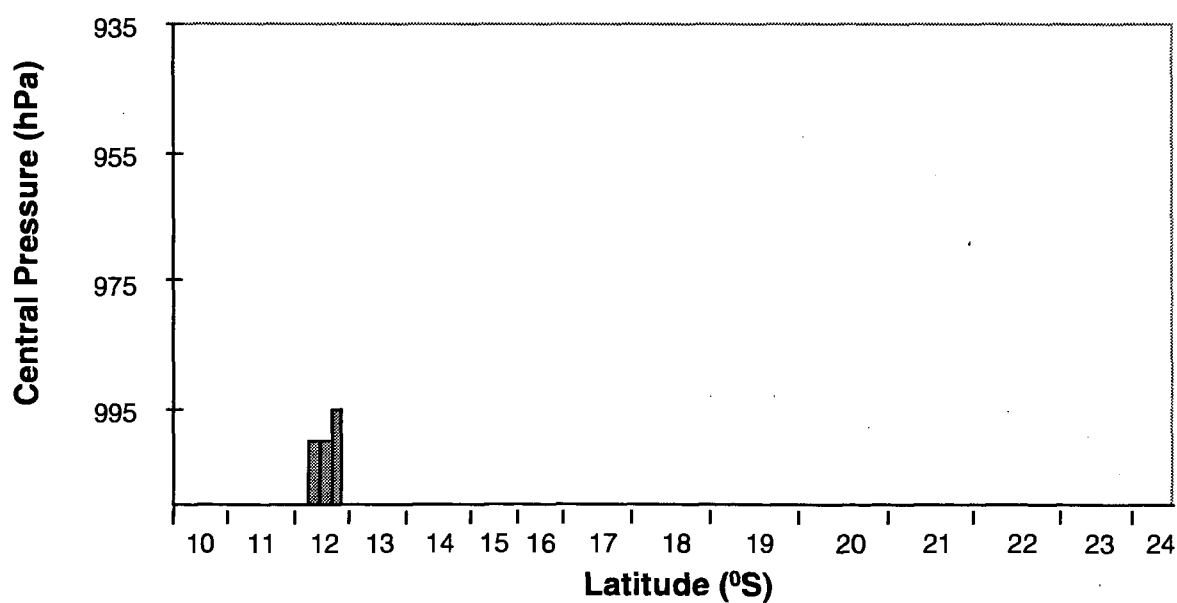
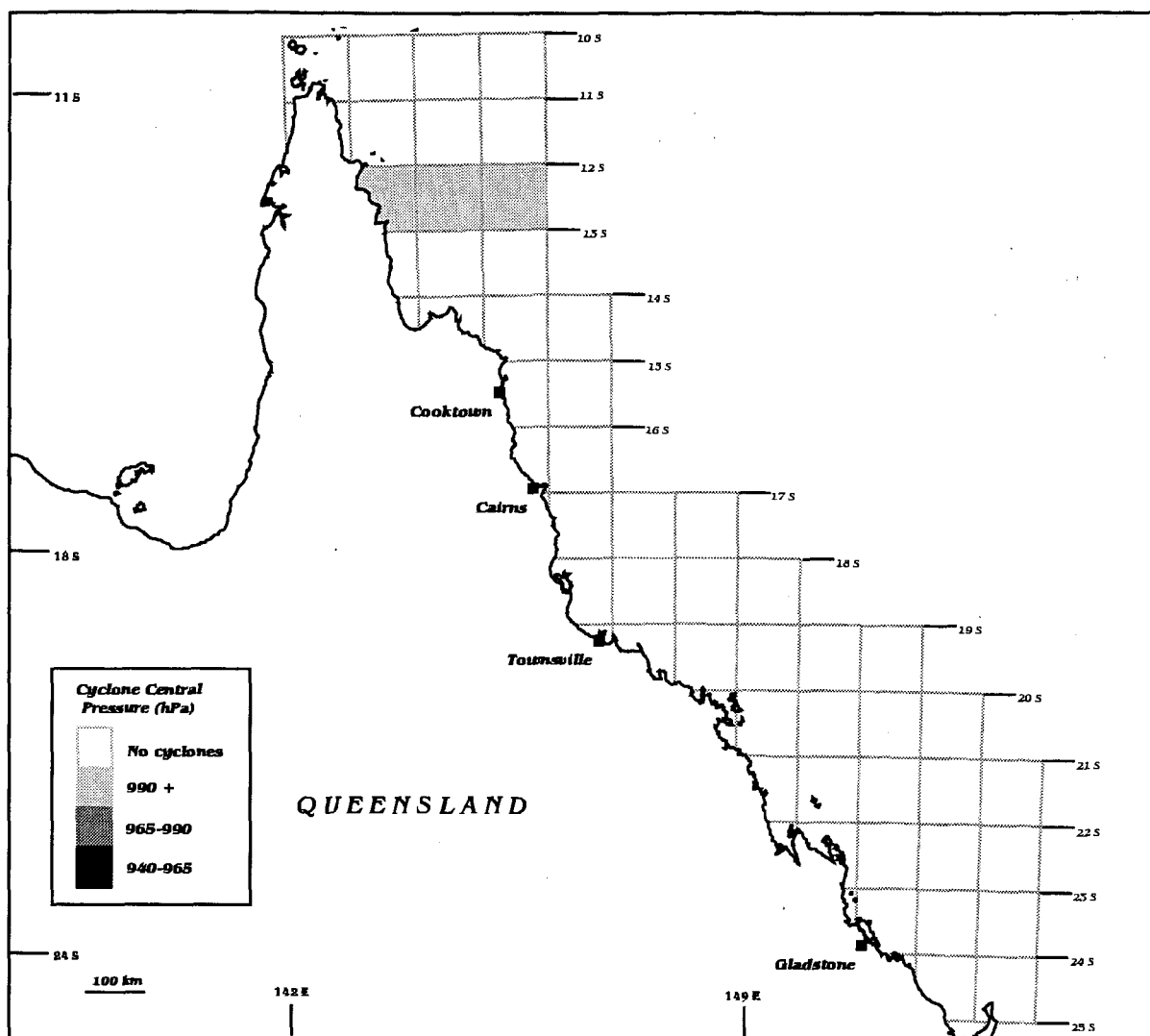
Map 56: *Minimum central pressures recorded in February in the GBR Region 1969-1997.*



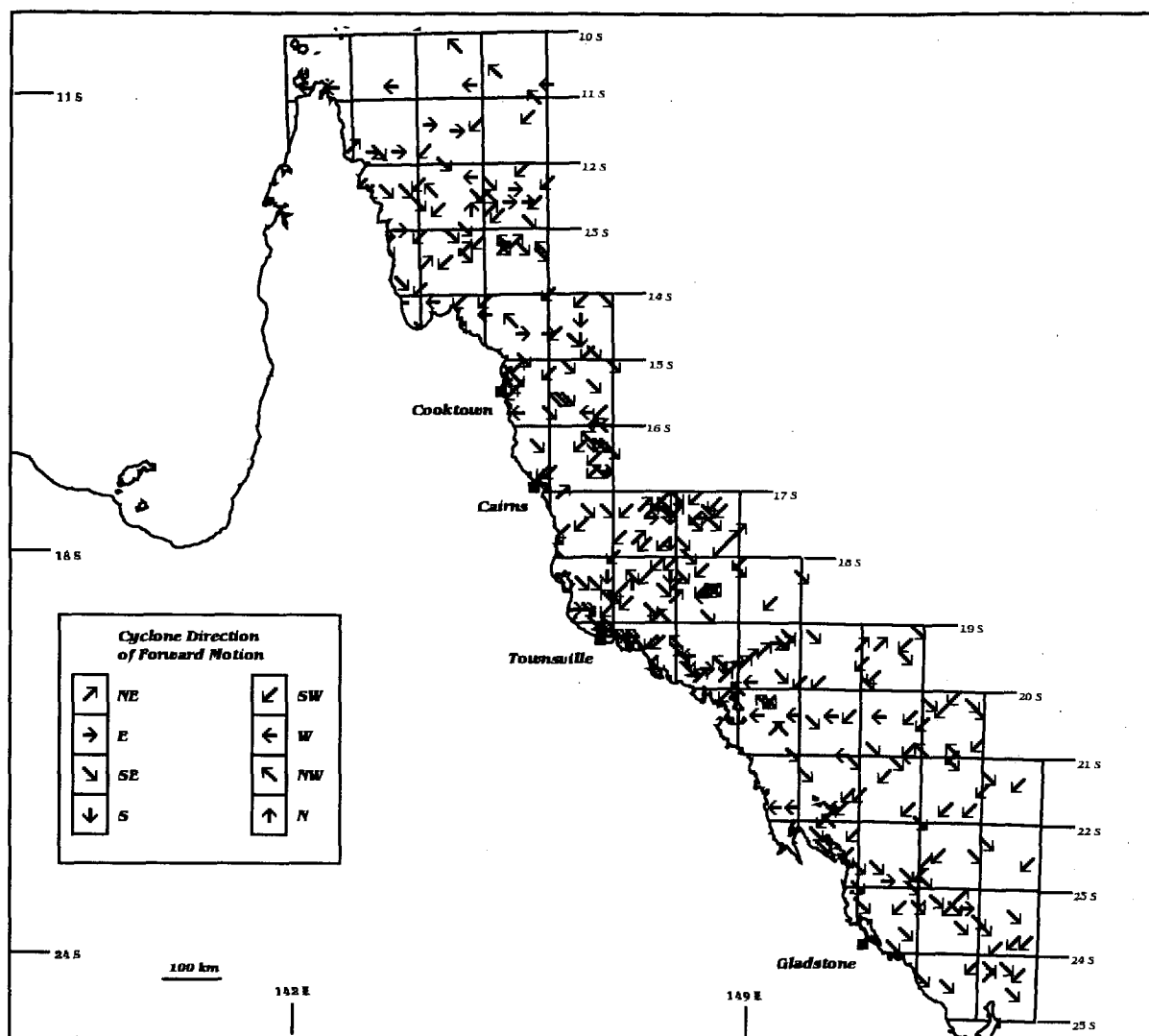
Map 57: Minimum central pressures recorded in March in the GBR Region 1969-1997.



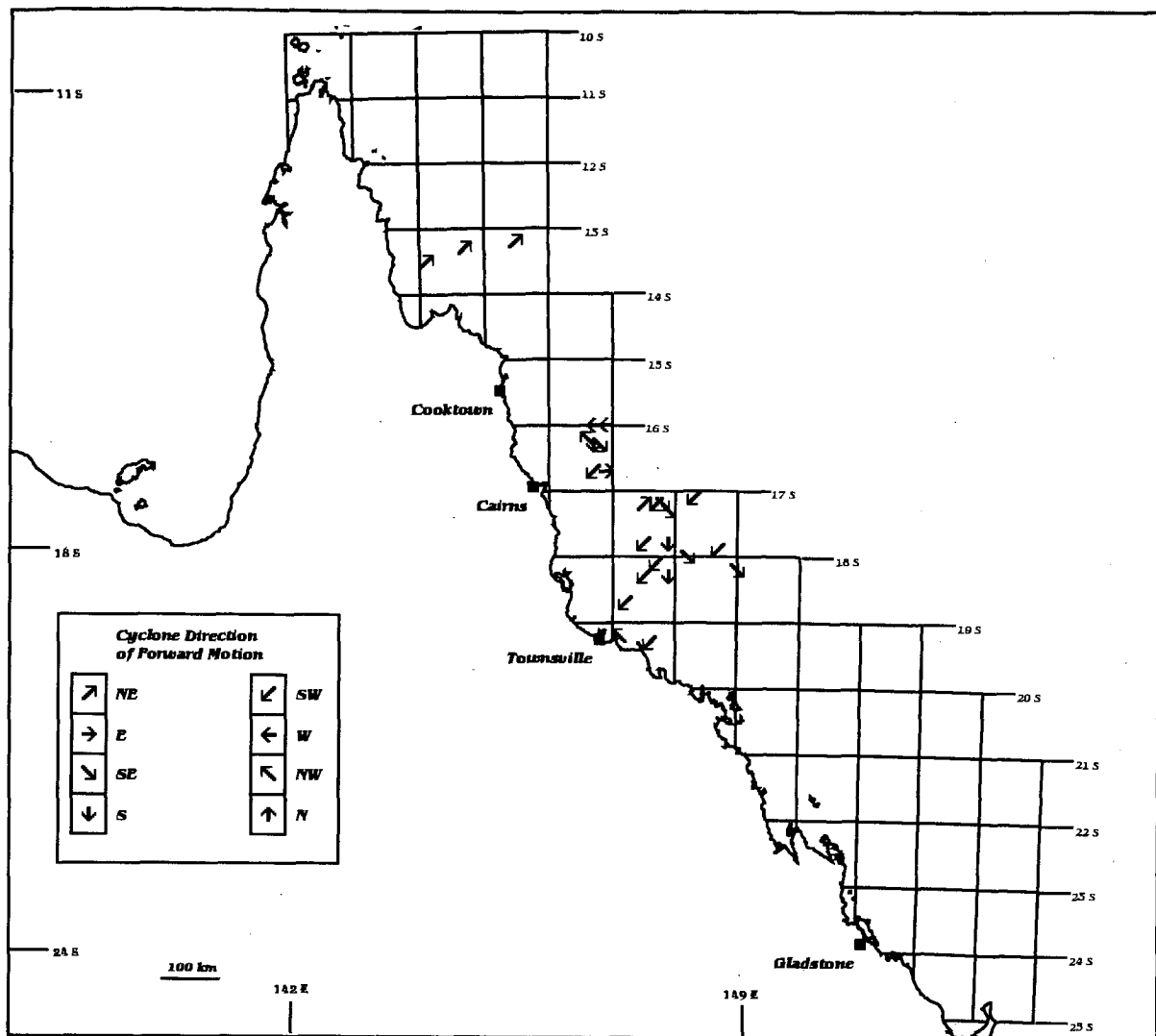
Map 58: *Minimum central pressures recorded in April in the GBR Region 1969-1997.*



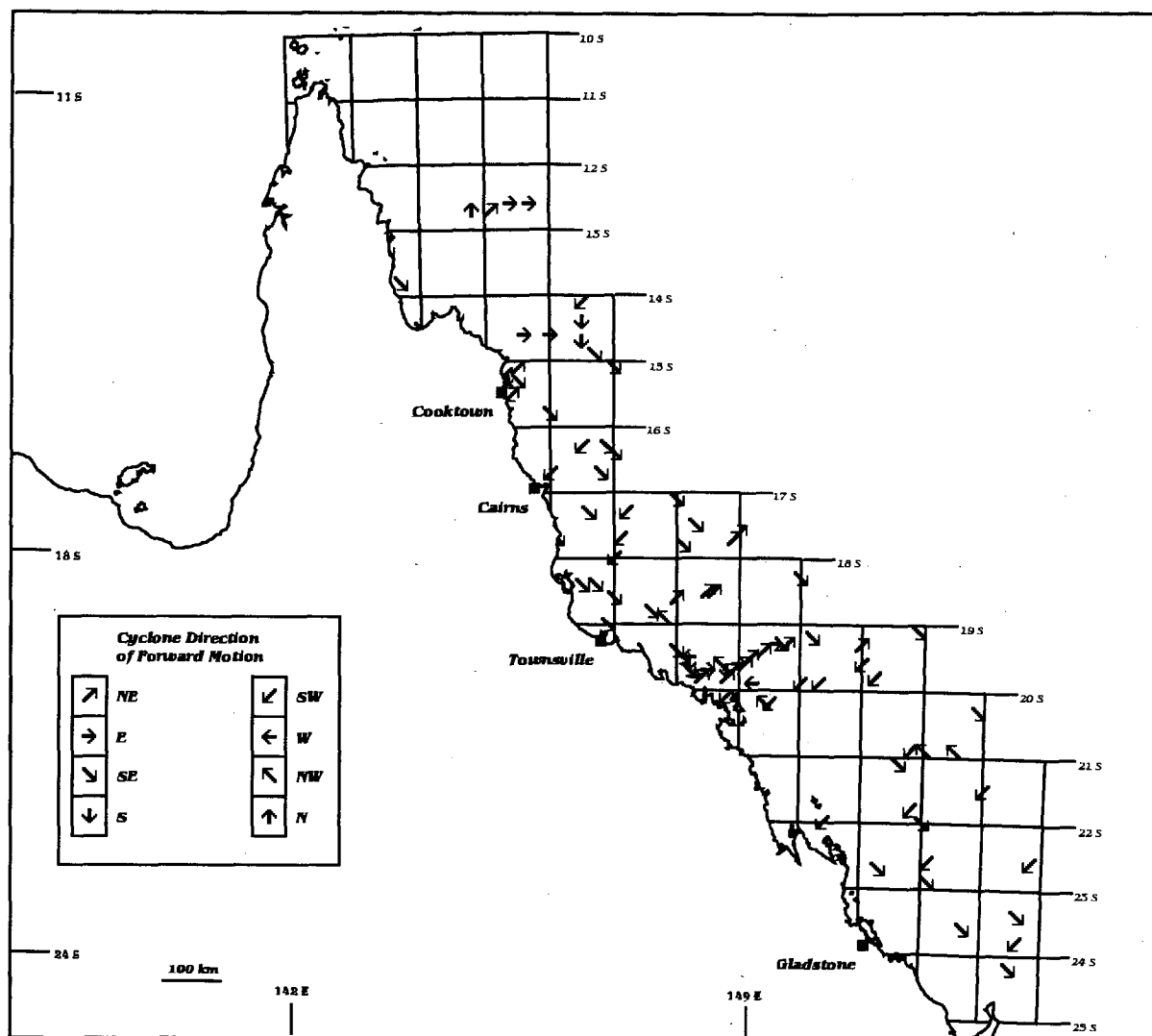
Map 59: *Minimum central pressures recorded in May in the GBR Region 1969-1997.*



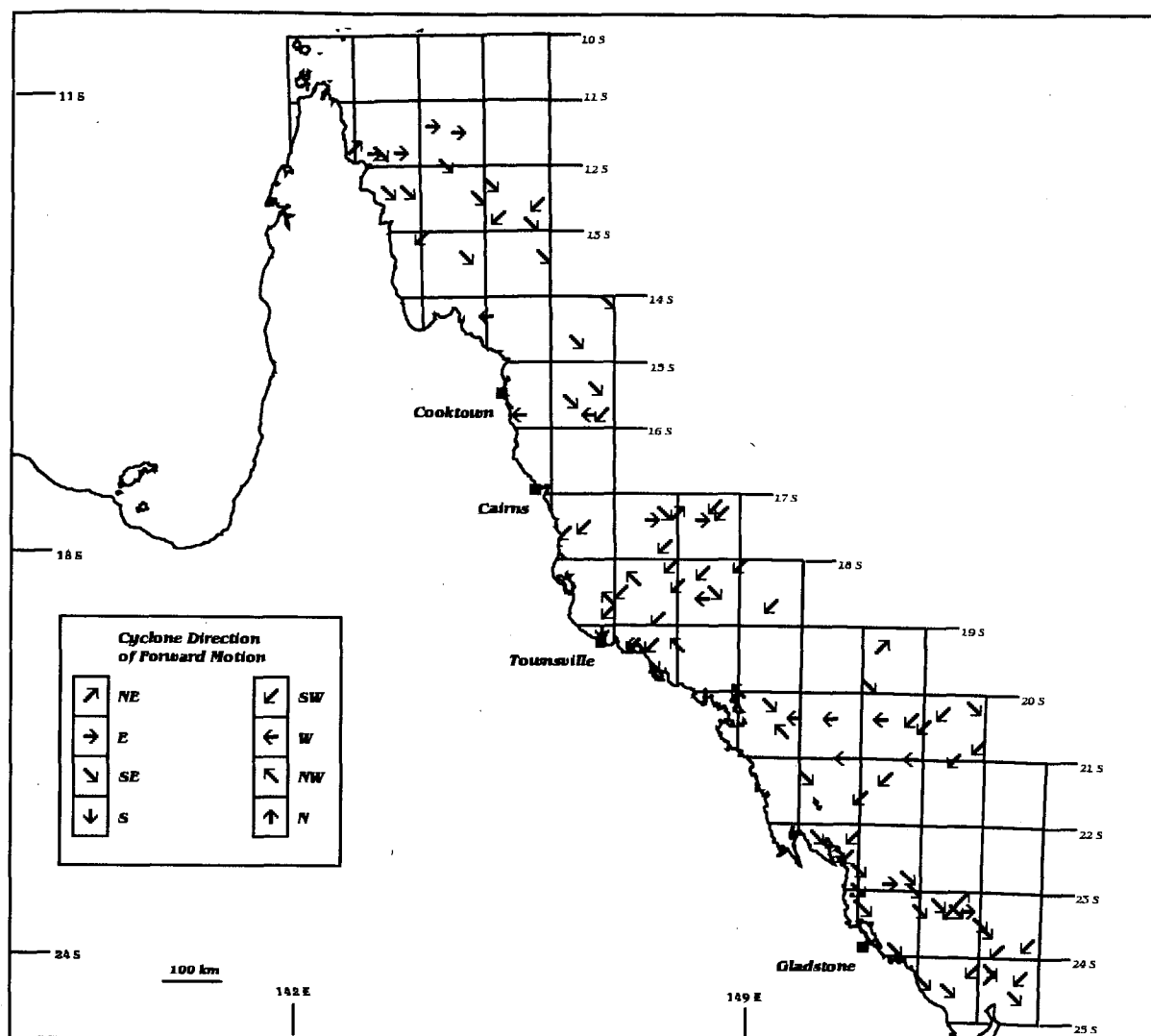
Map 60: All months: direction of forward motion of cyclones at observed positions 1969-1997.



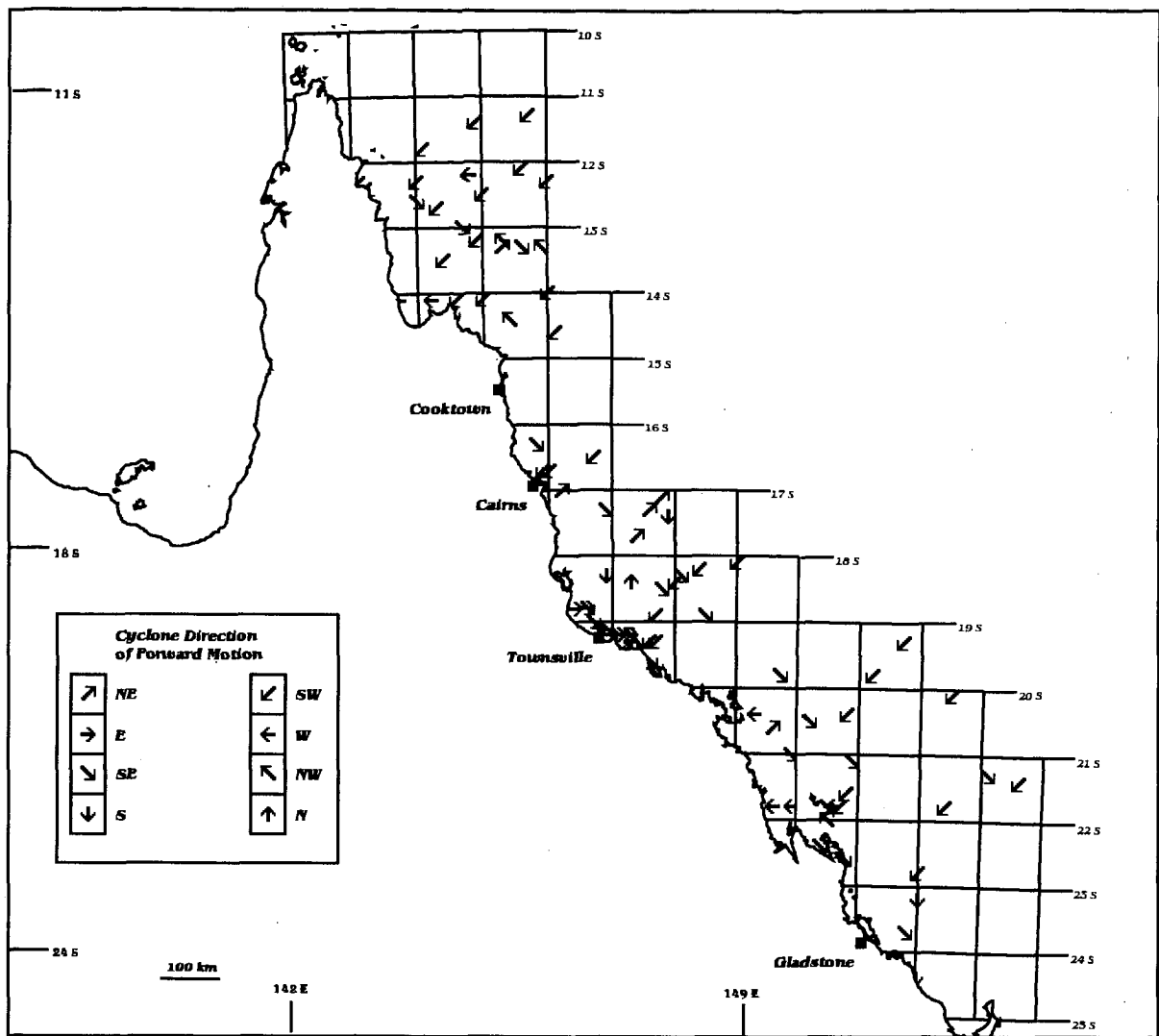
Map 61: *December: direction of forward motion of cyclones at observed positions 1969-1997.*



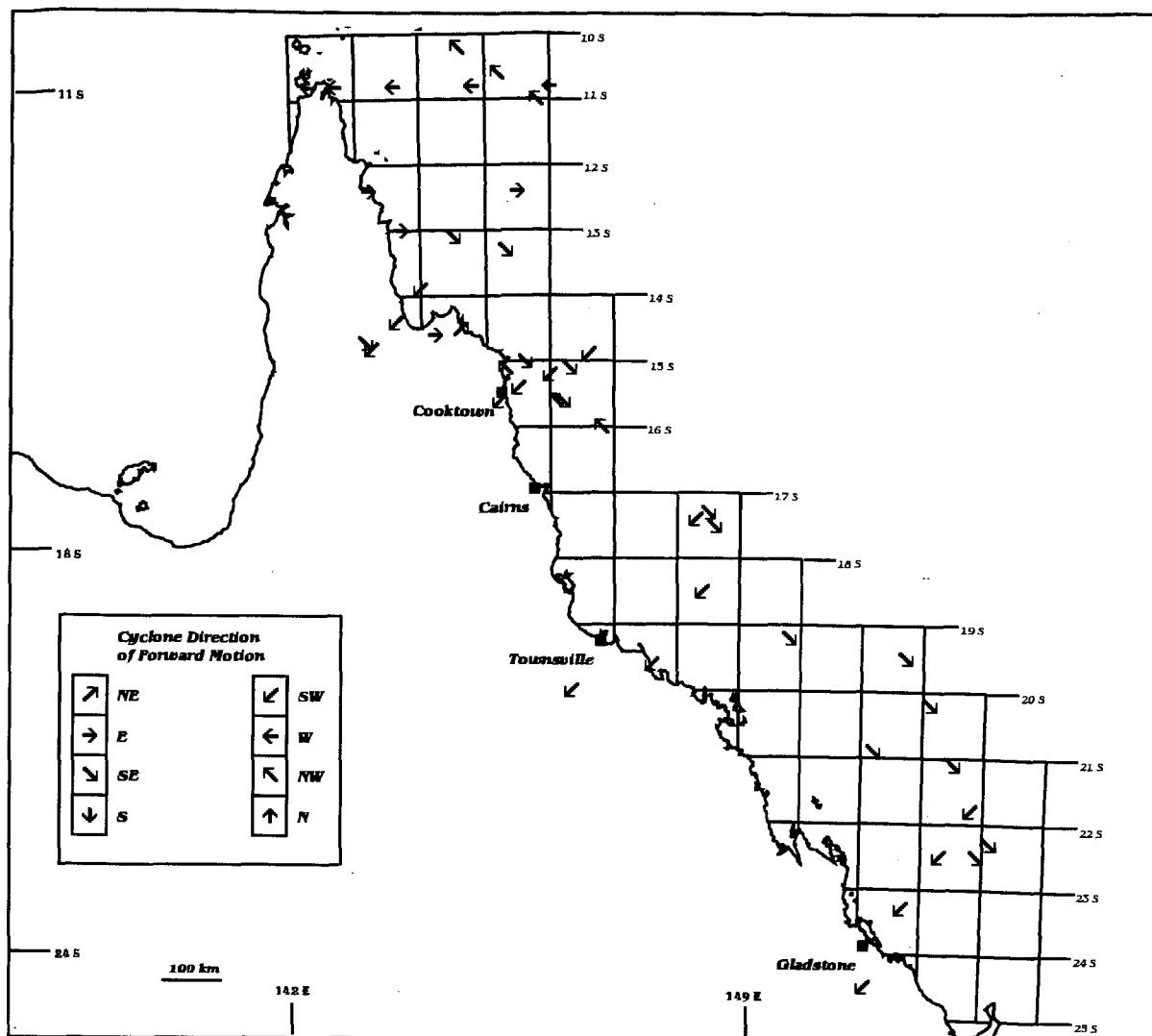
Map 62: *January: direction of forward motion of cyclones at observed positions 1969-1997.*



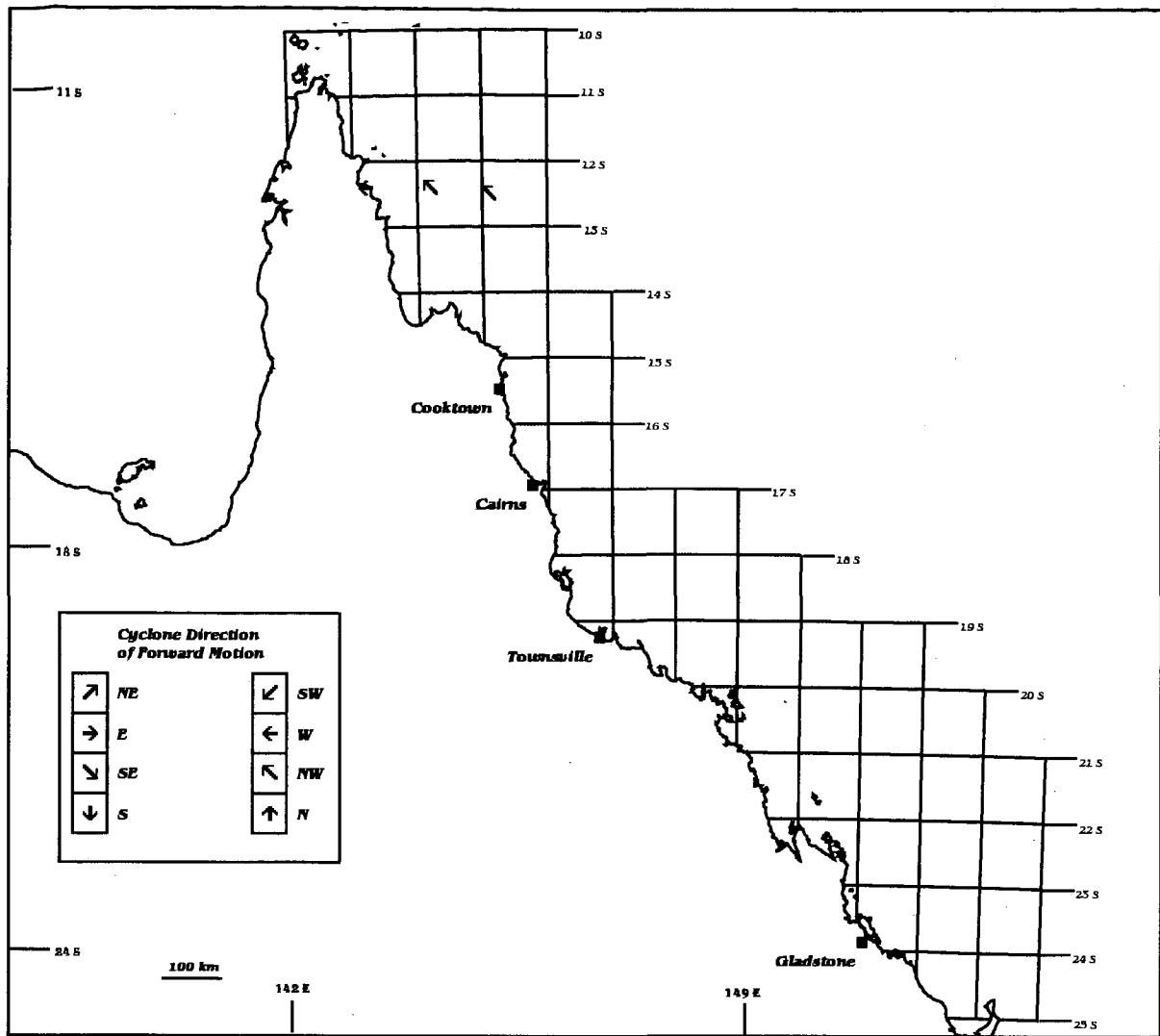
Map 63: *February: direction of forward motion of cyclones at observed positions 1969-1997.*



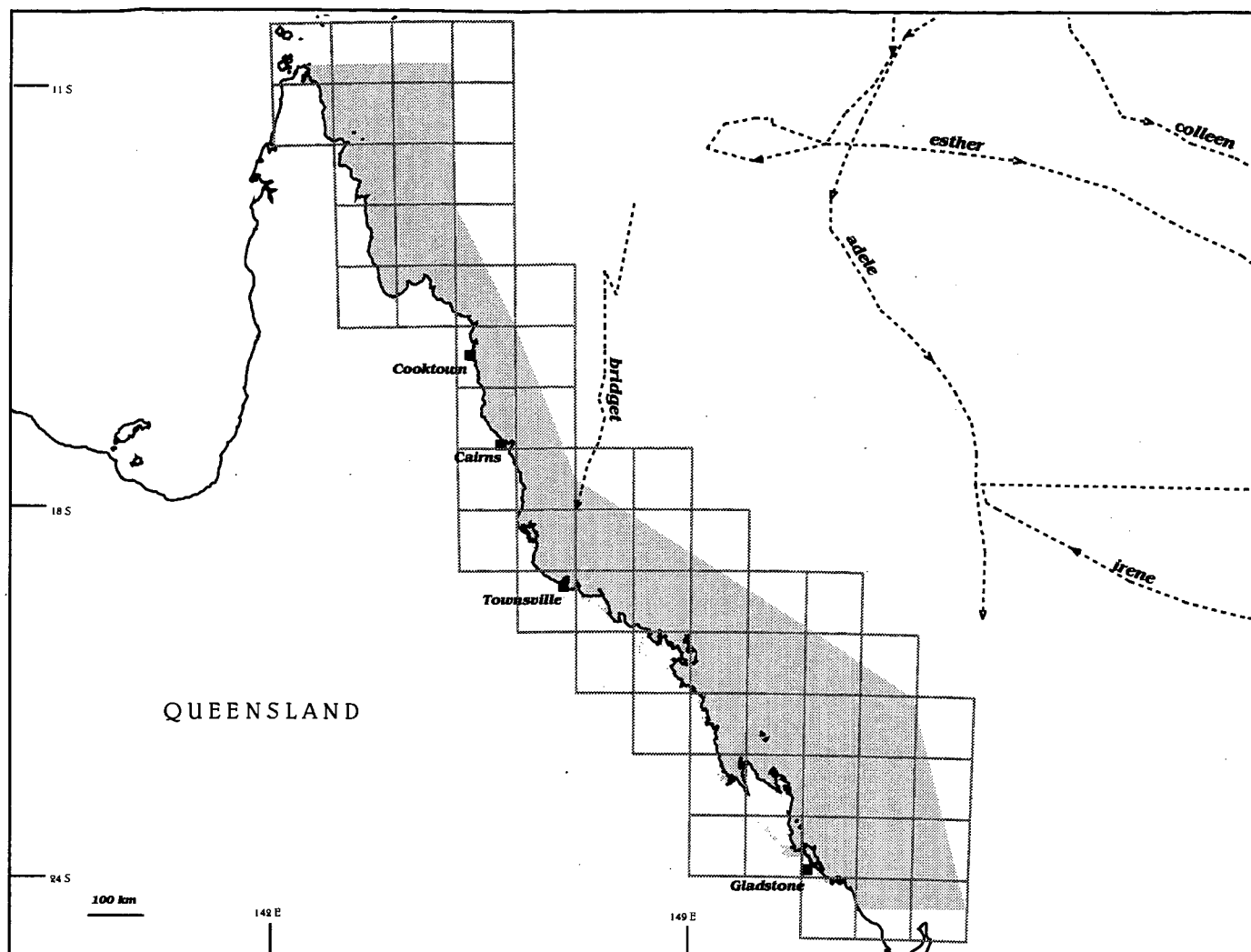
Map 64: *March: direction of forward motion of cyclones at observed positions 1969-1997.*



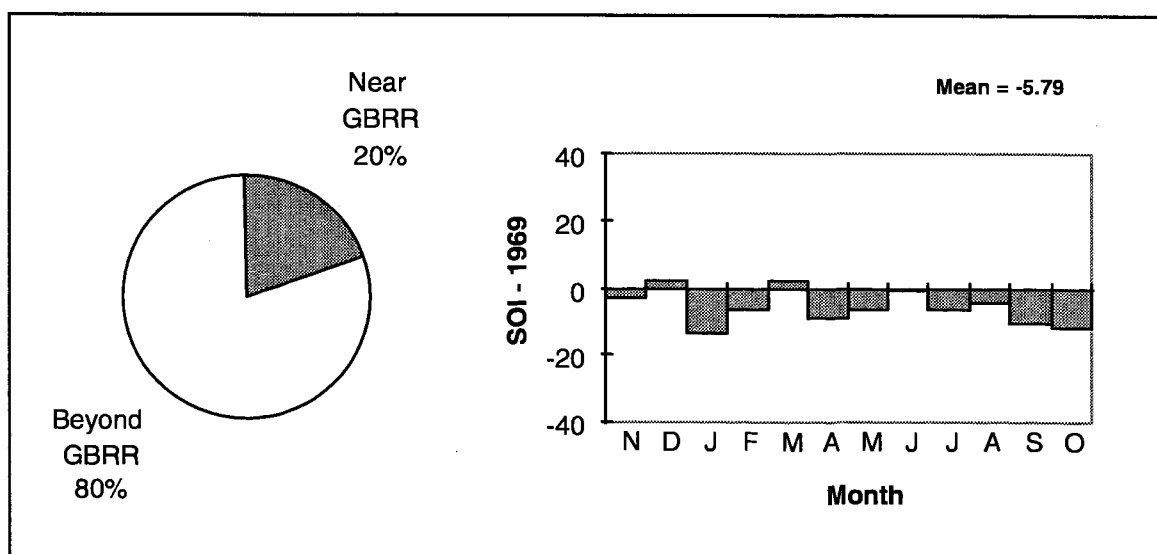
Map 65: *April: direction of forward motion of cyclones at observed positions 1969-1997.*



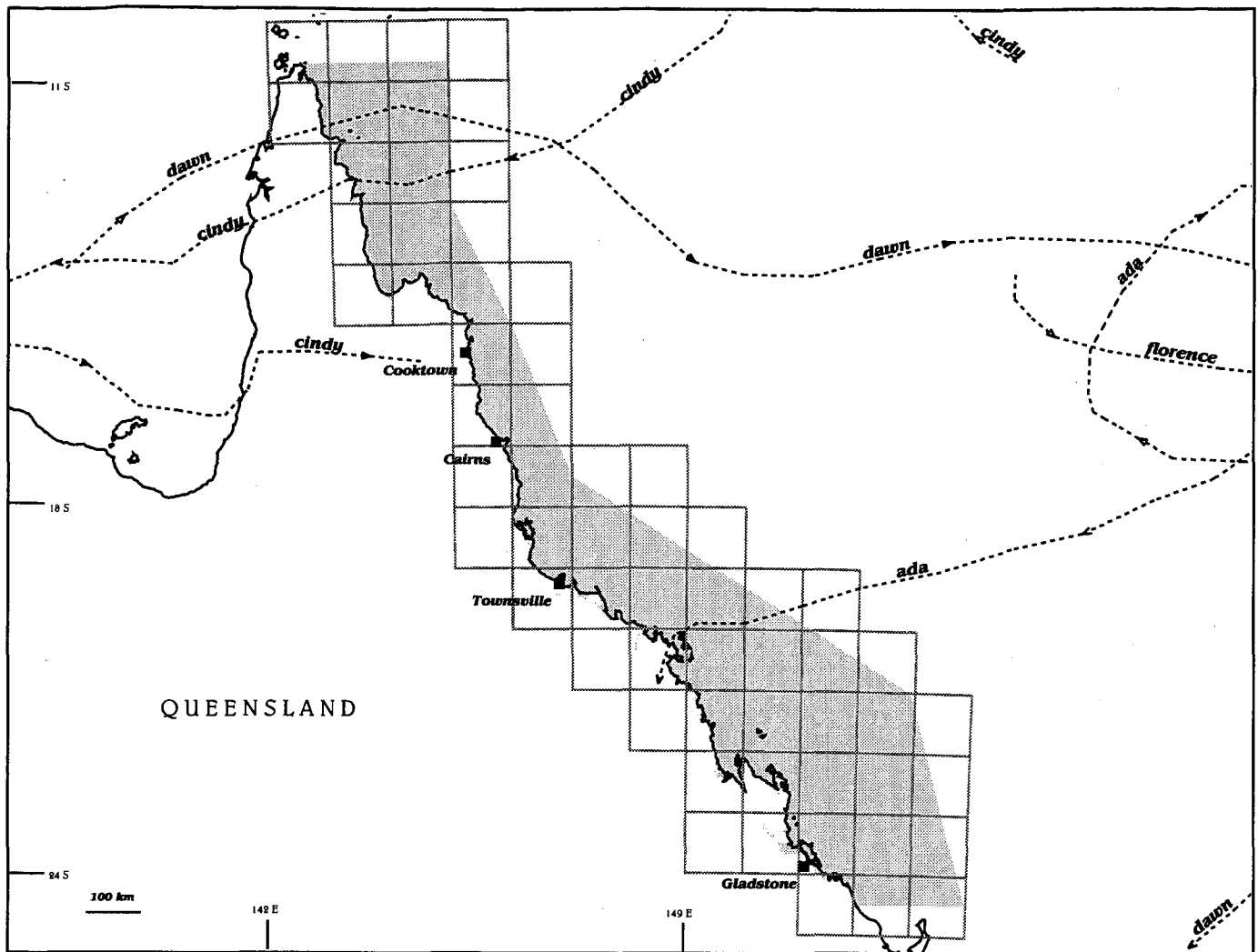
Map 66: May: direction of forward motion of cyclones at observed positions 1969-1997.



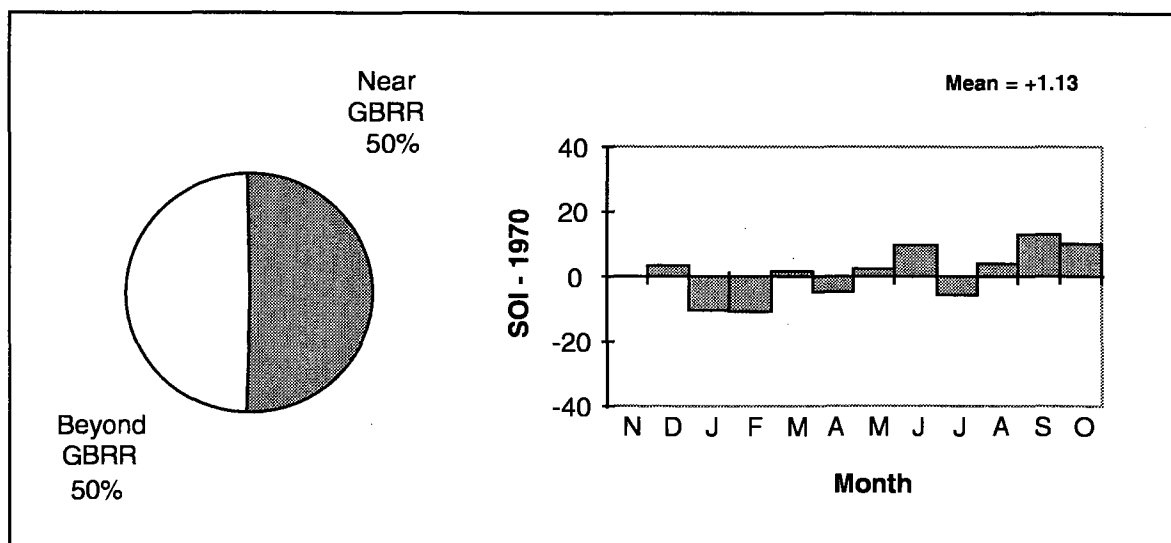
1968-1969



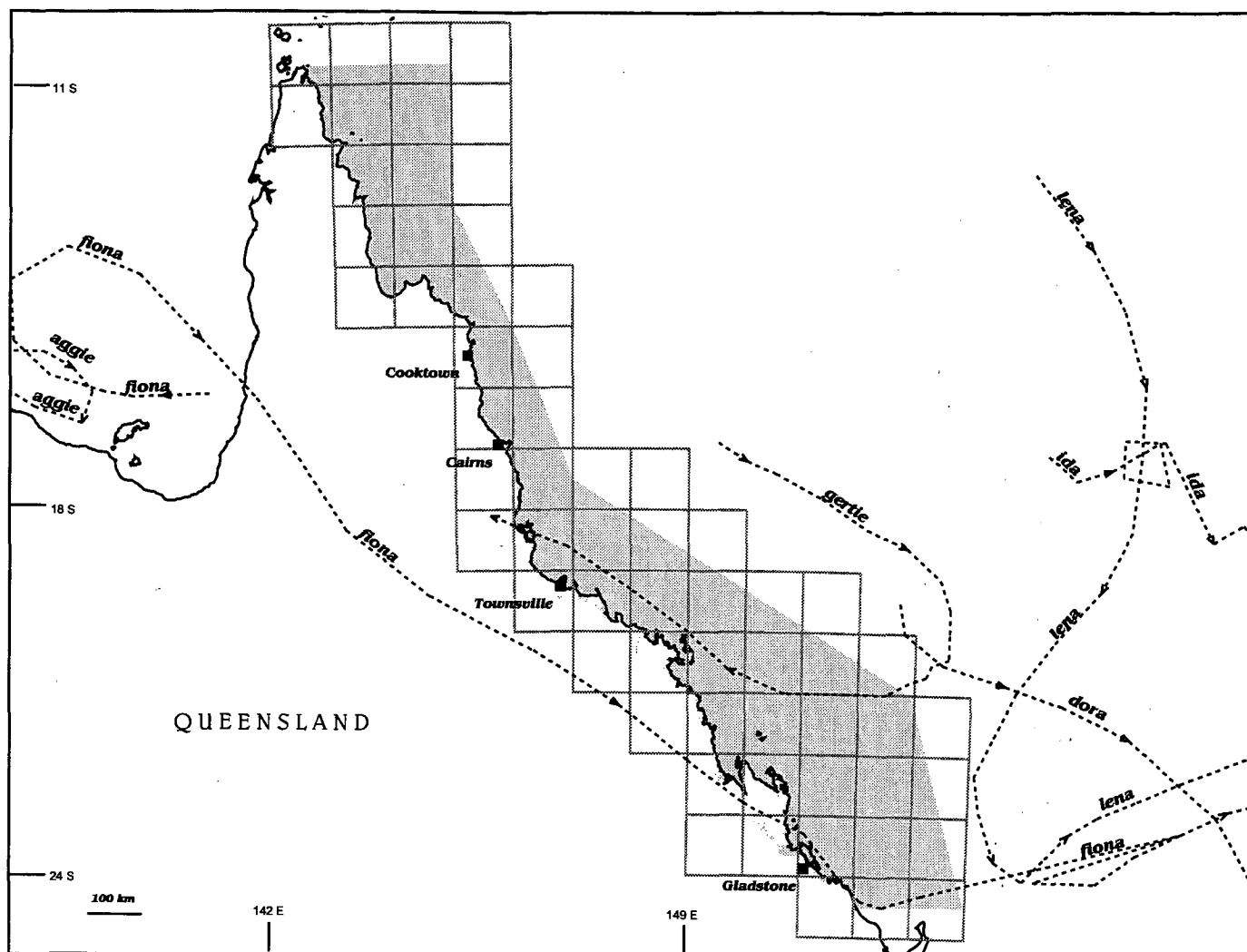
Map 67: 1969: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



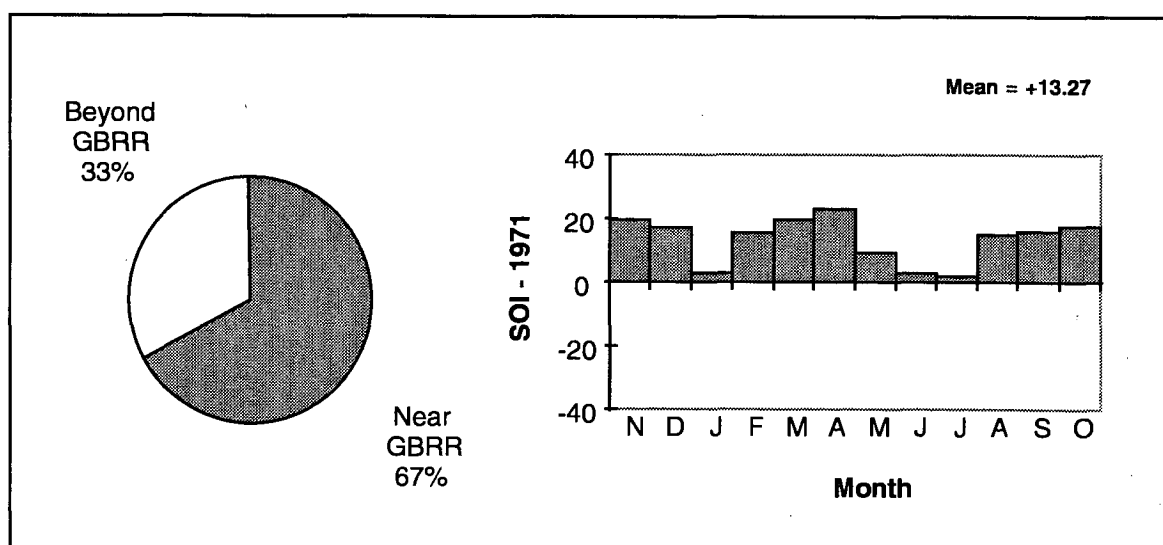
1969-1970



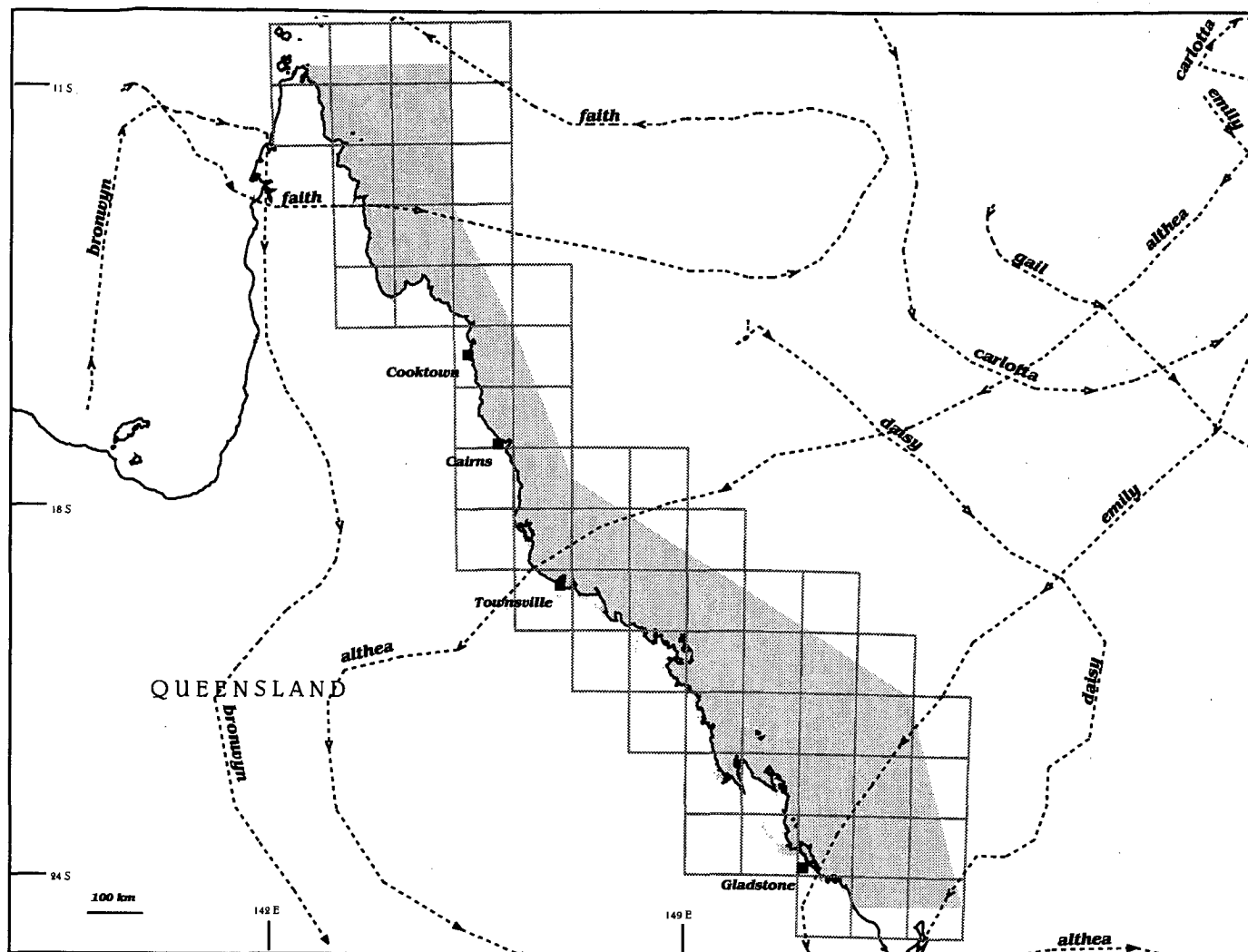
Map 68: 1970: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



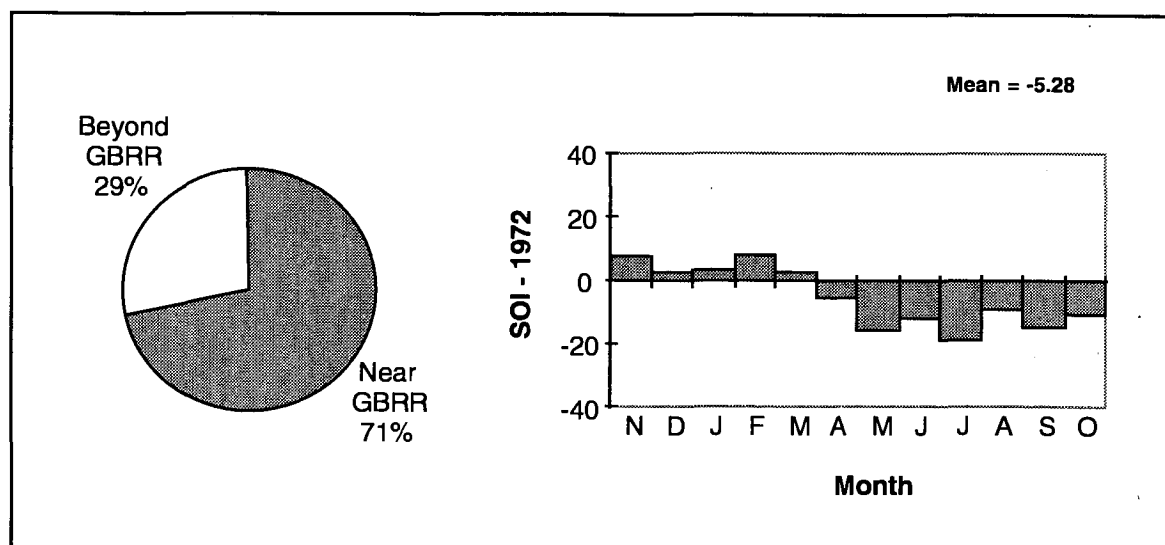
1970-1971



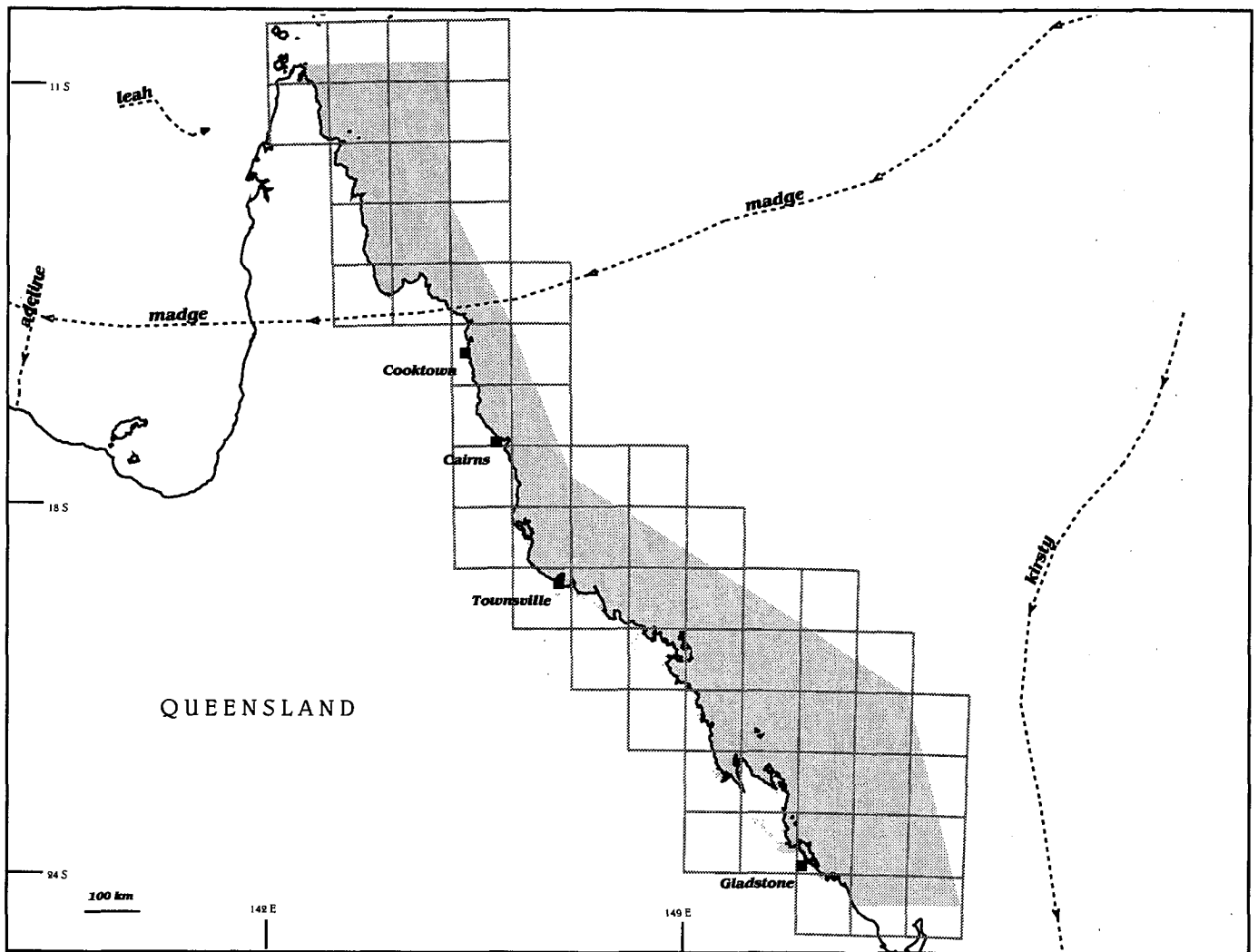
Map 69: 1971: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



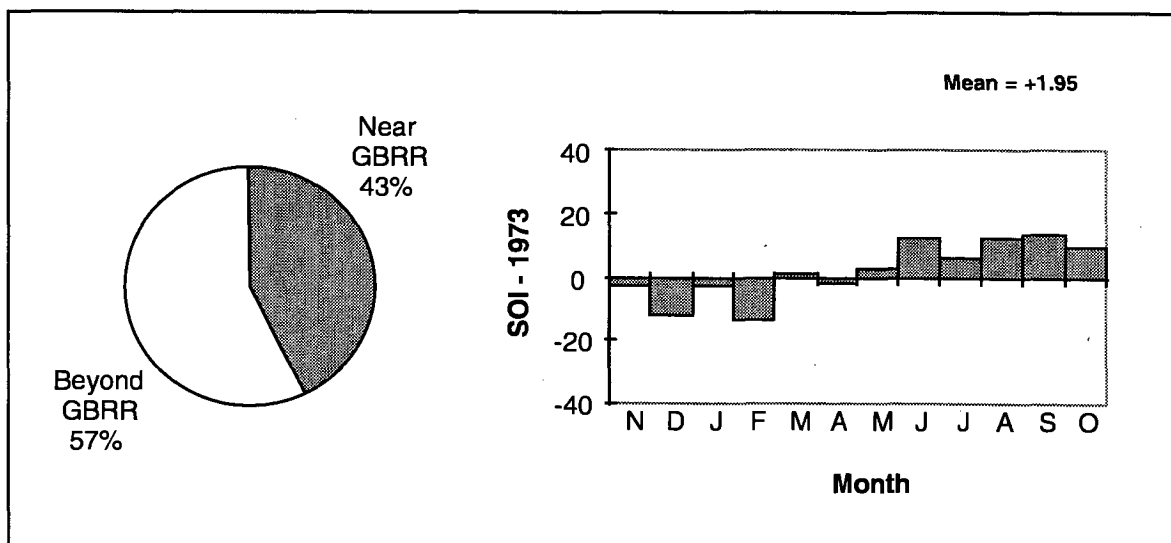
1971-1972



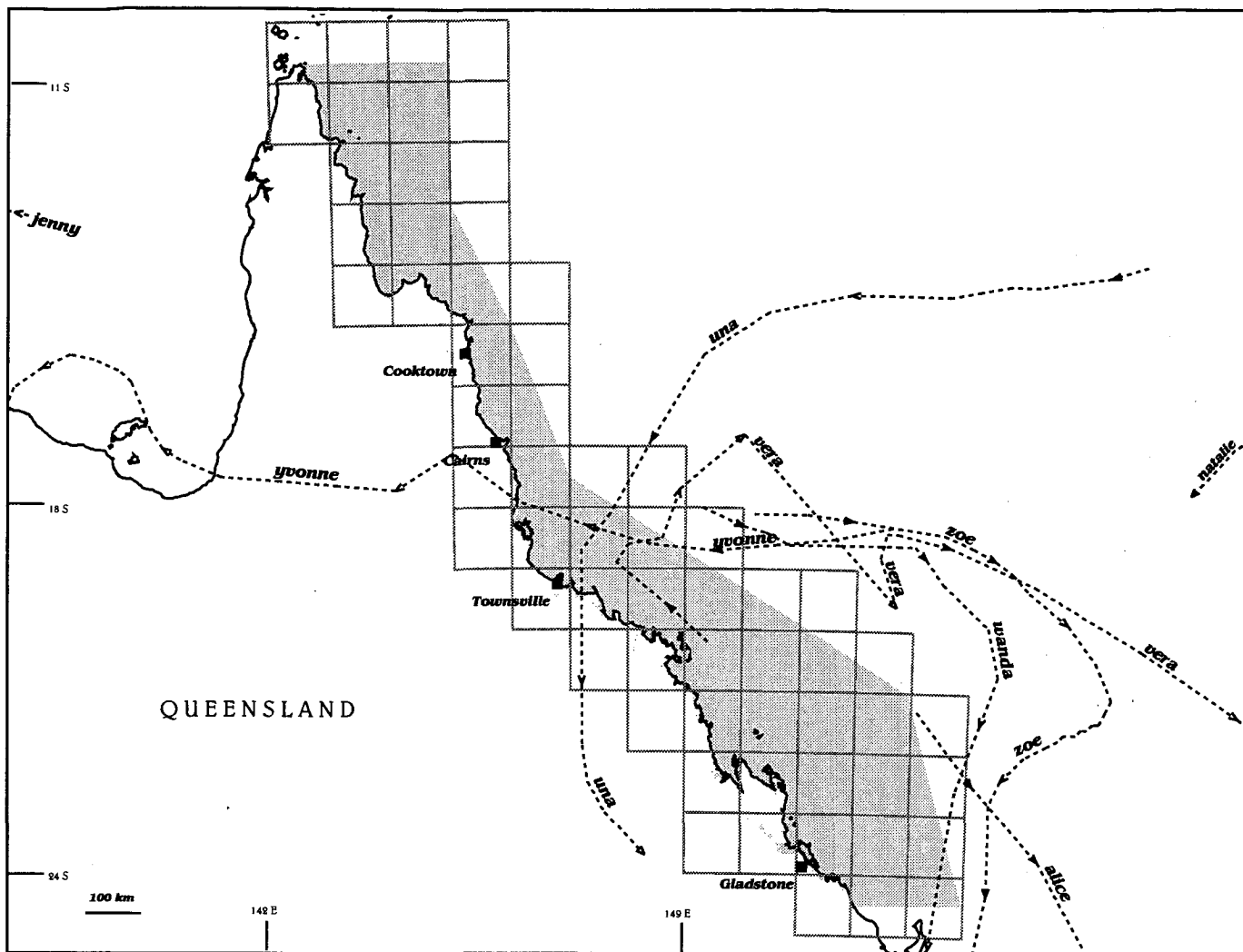
Map 70: 1972: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



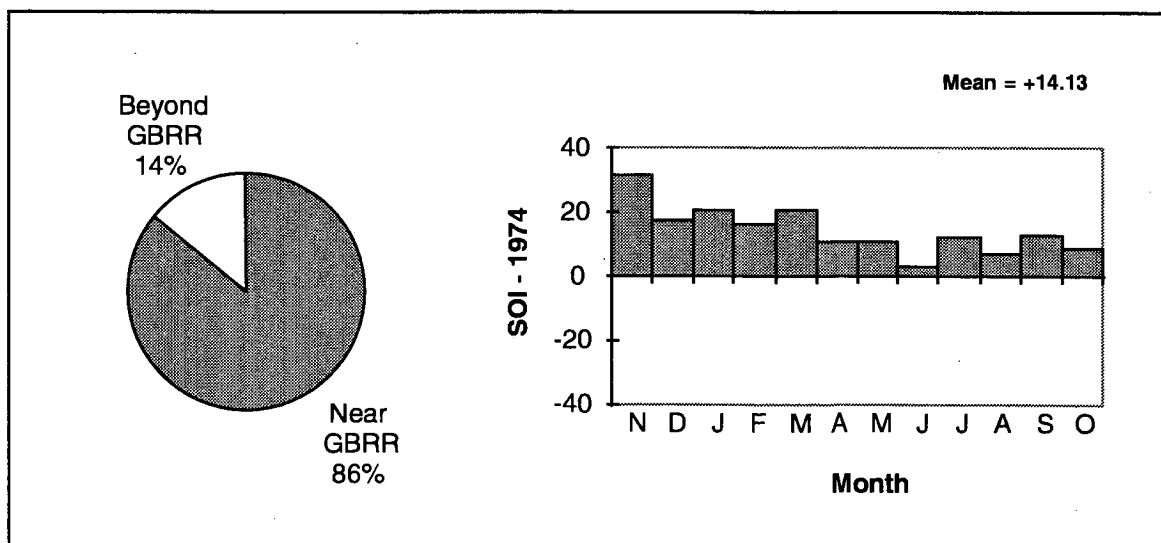
1972-1973



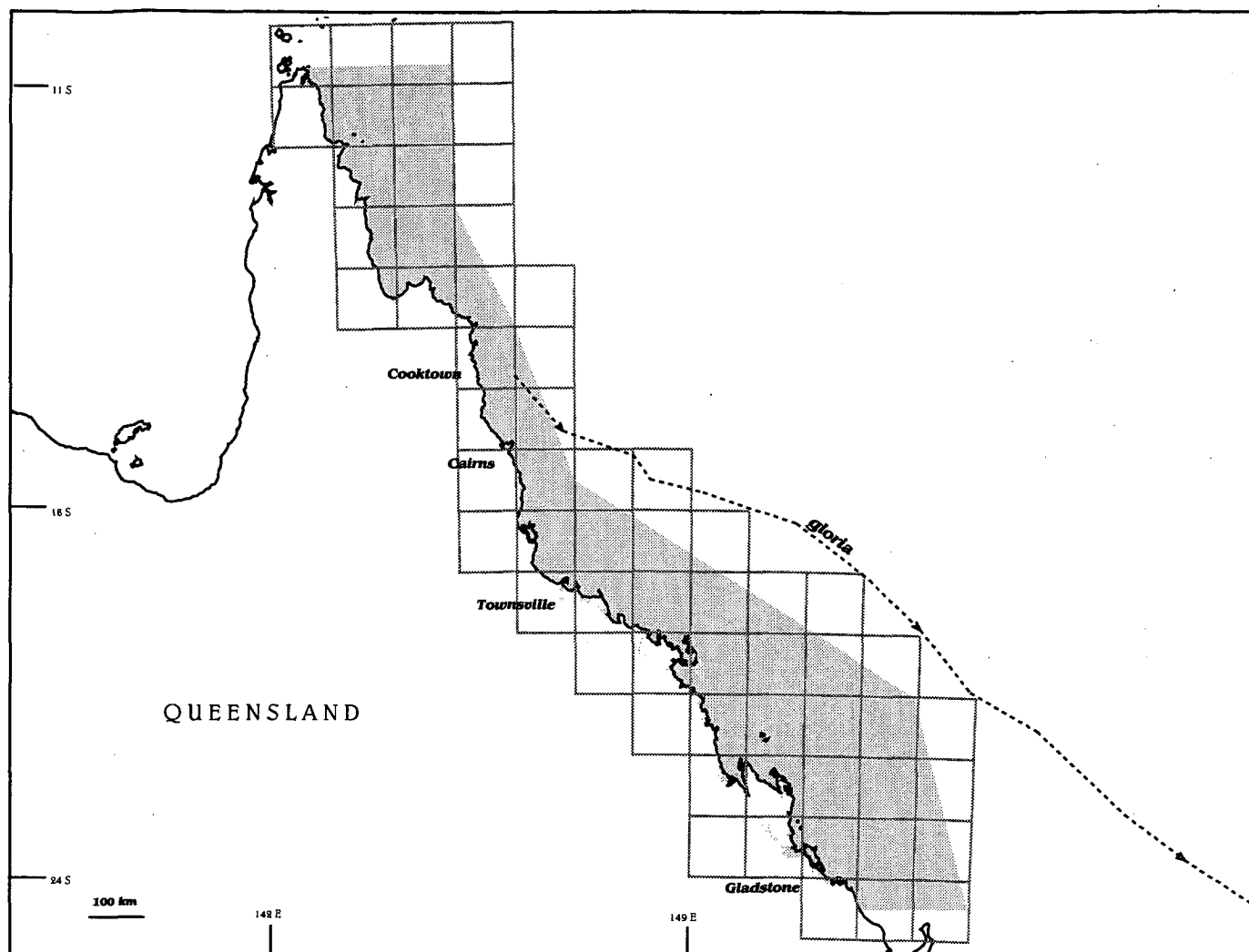
Map 71: 1973: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



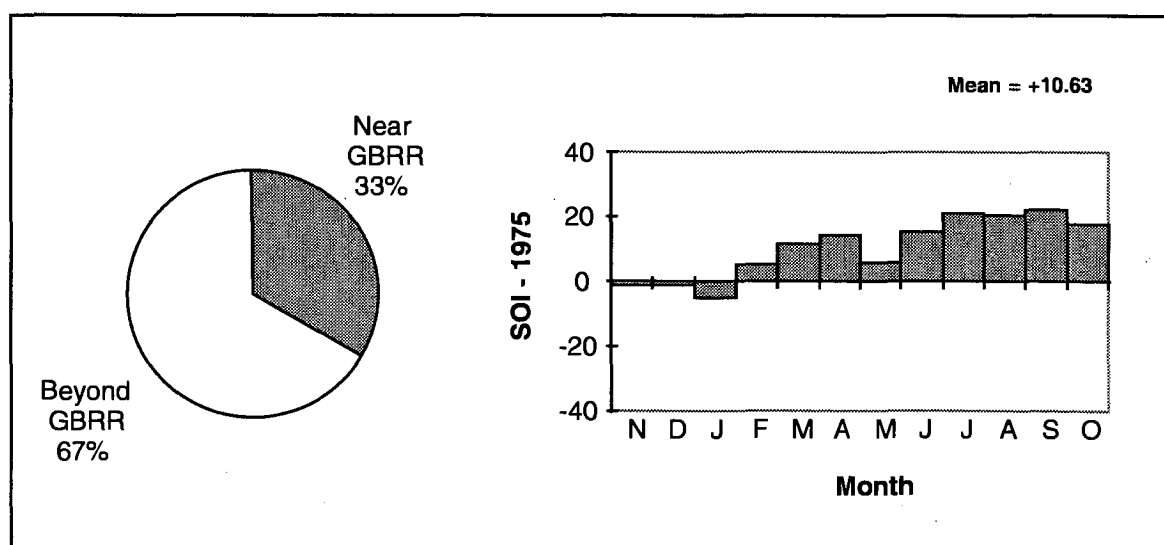
1973-1974



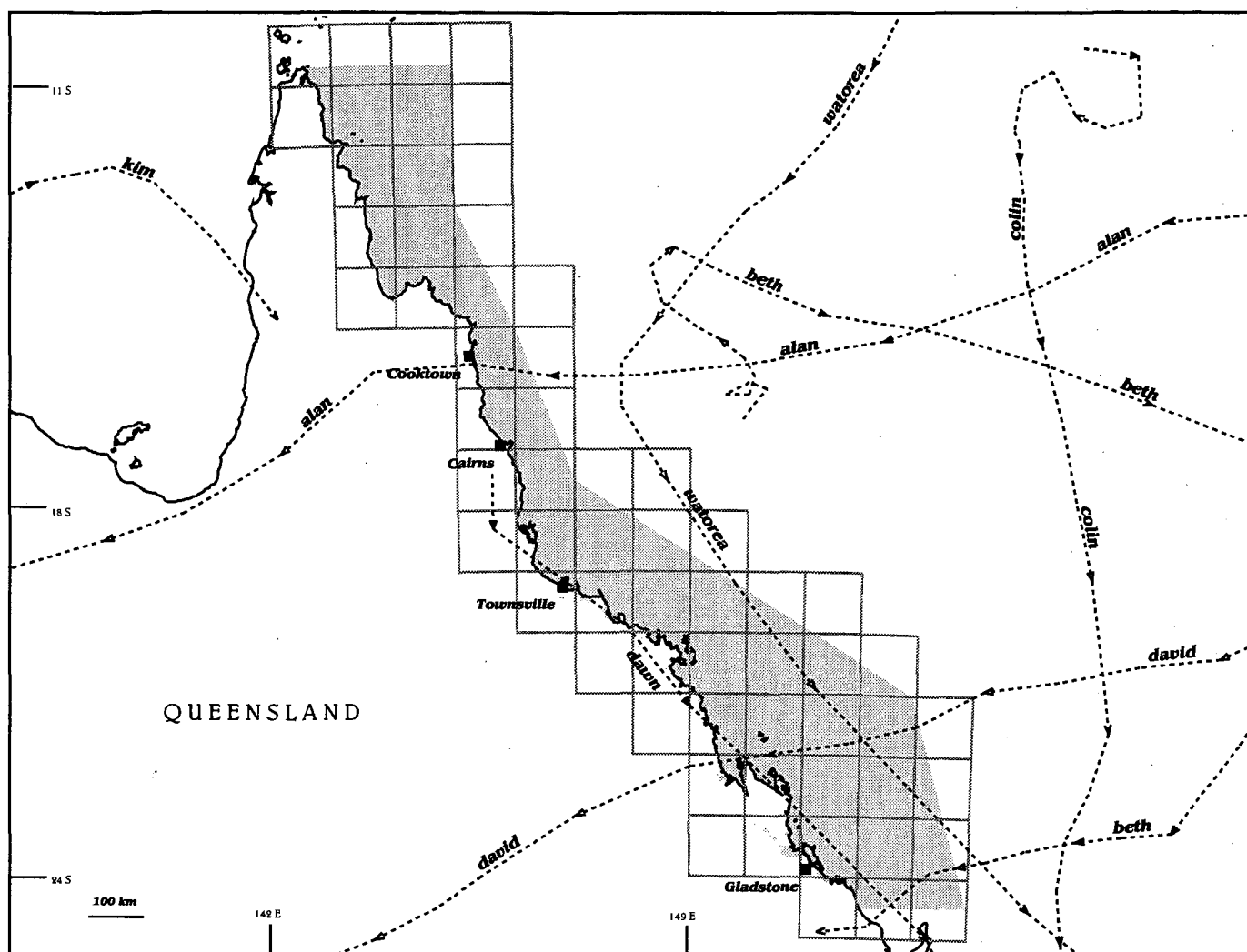
Map 72: *1974: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.*



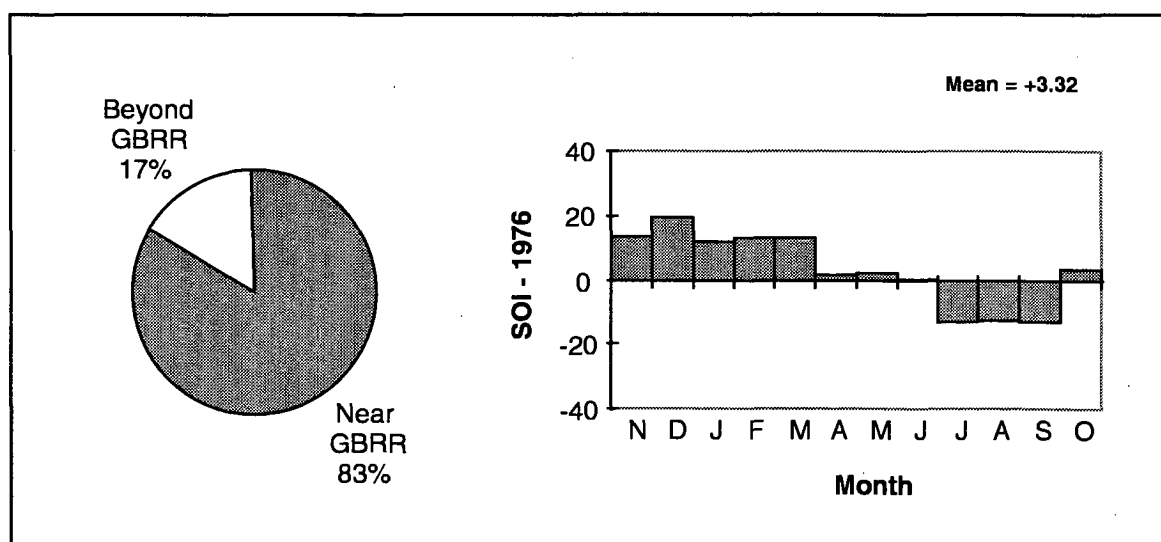
1974-1975



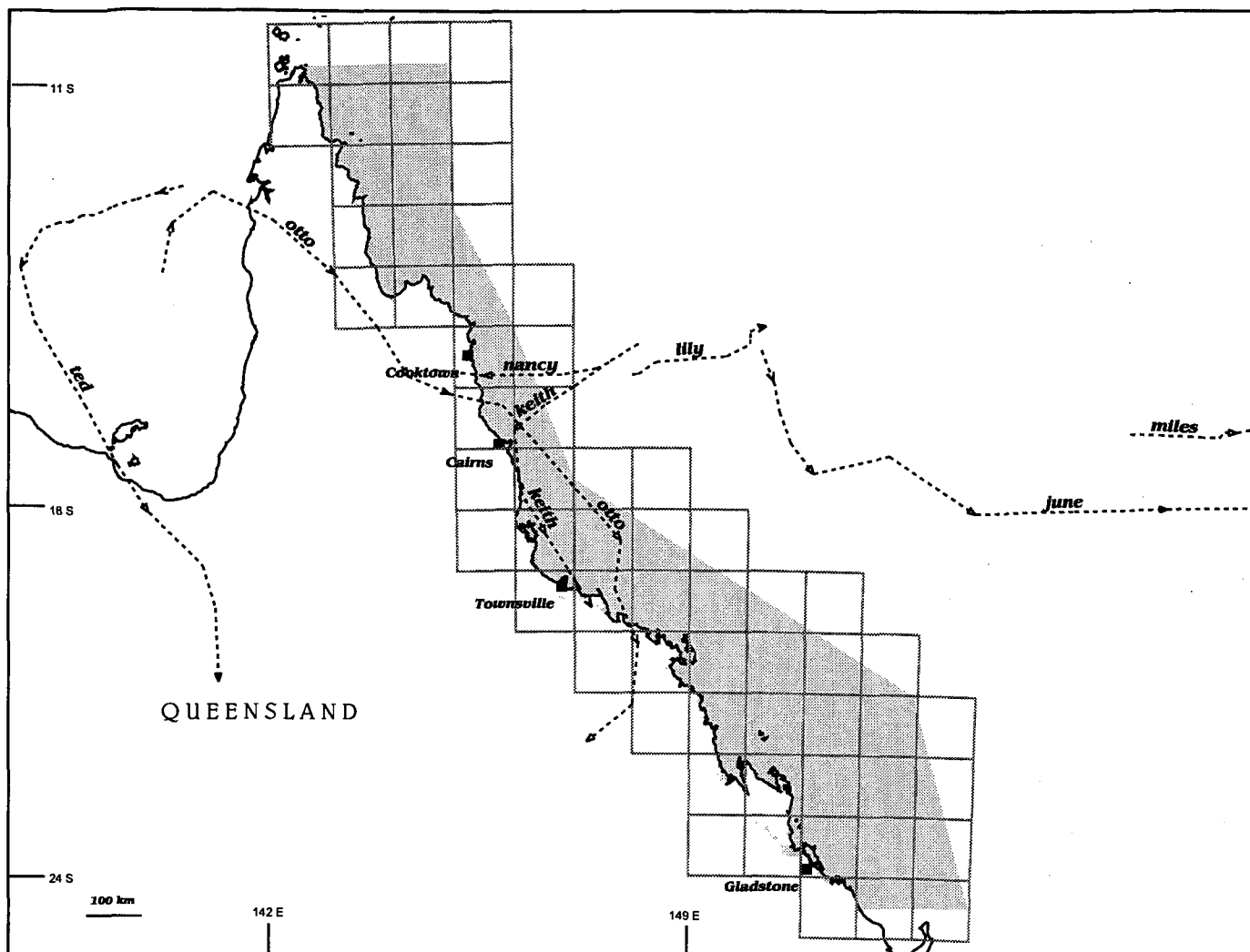
Map 73: 1975: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



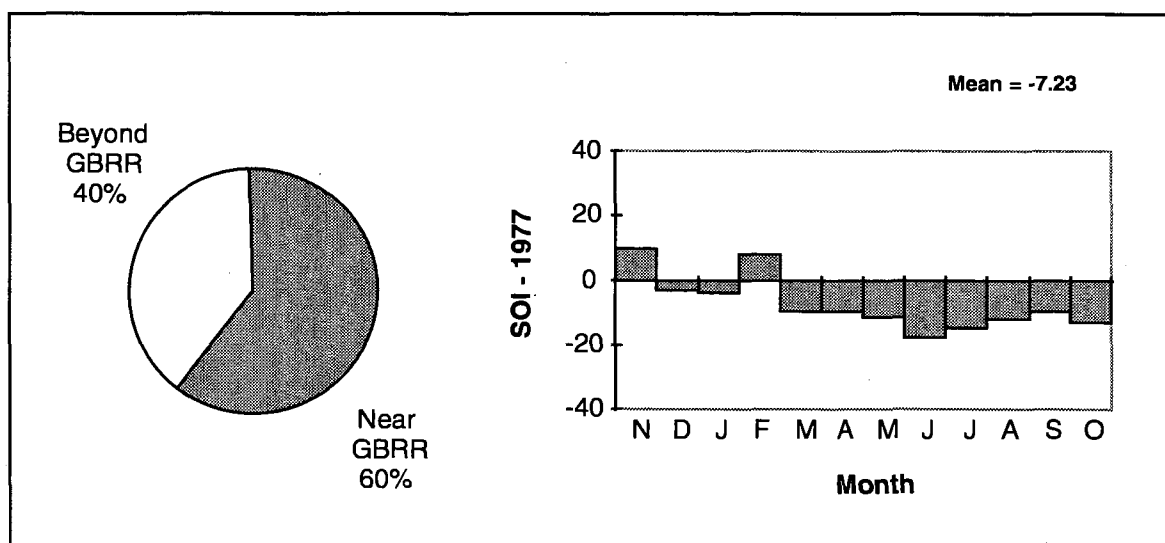
1975-1976



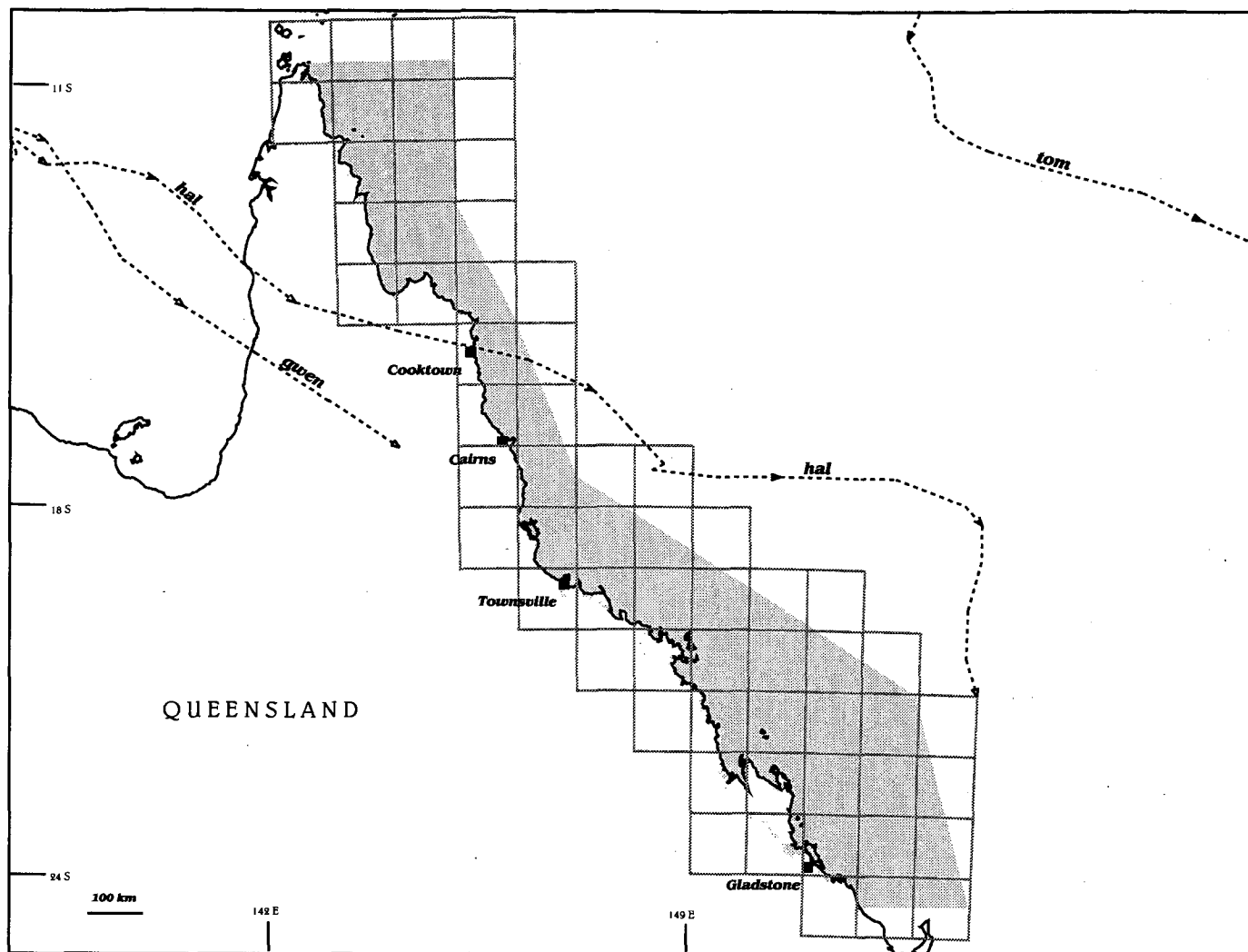
Map 74: *1976: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.*



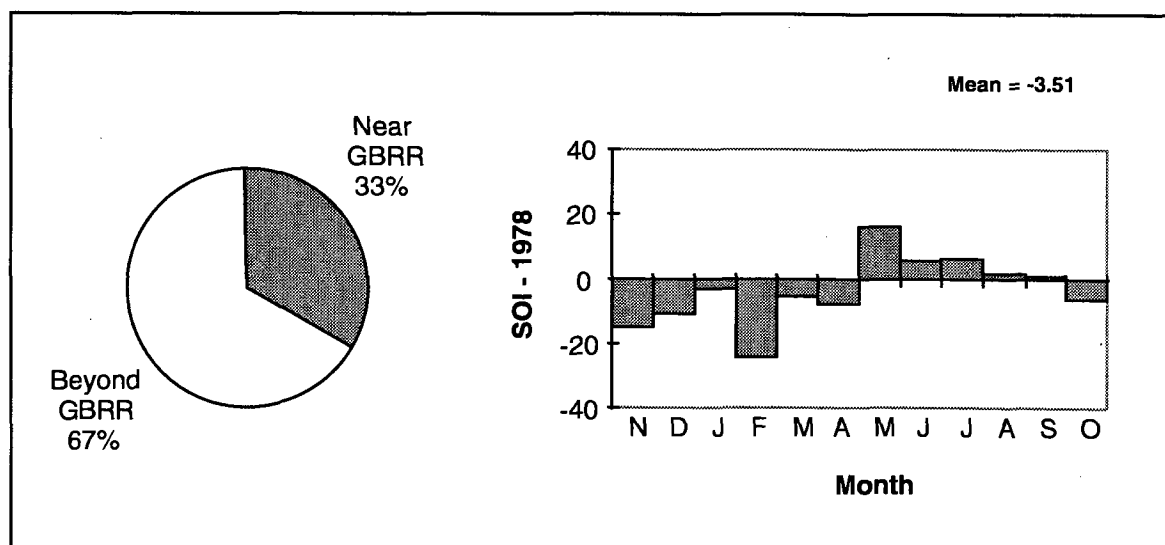
1976-1977



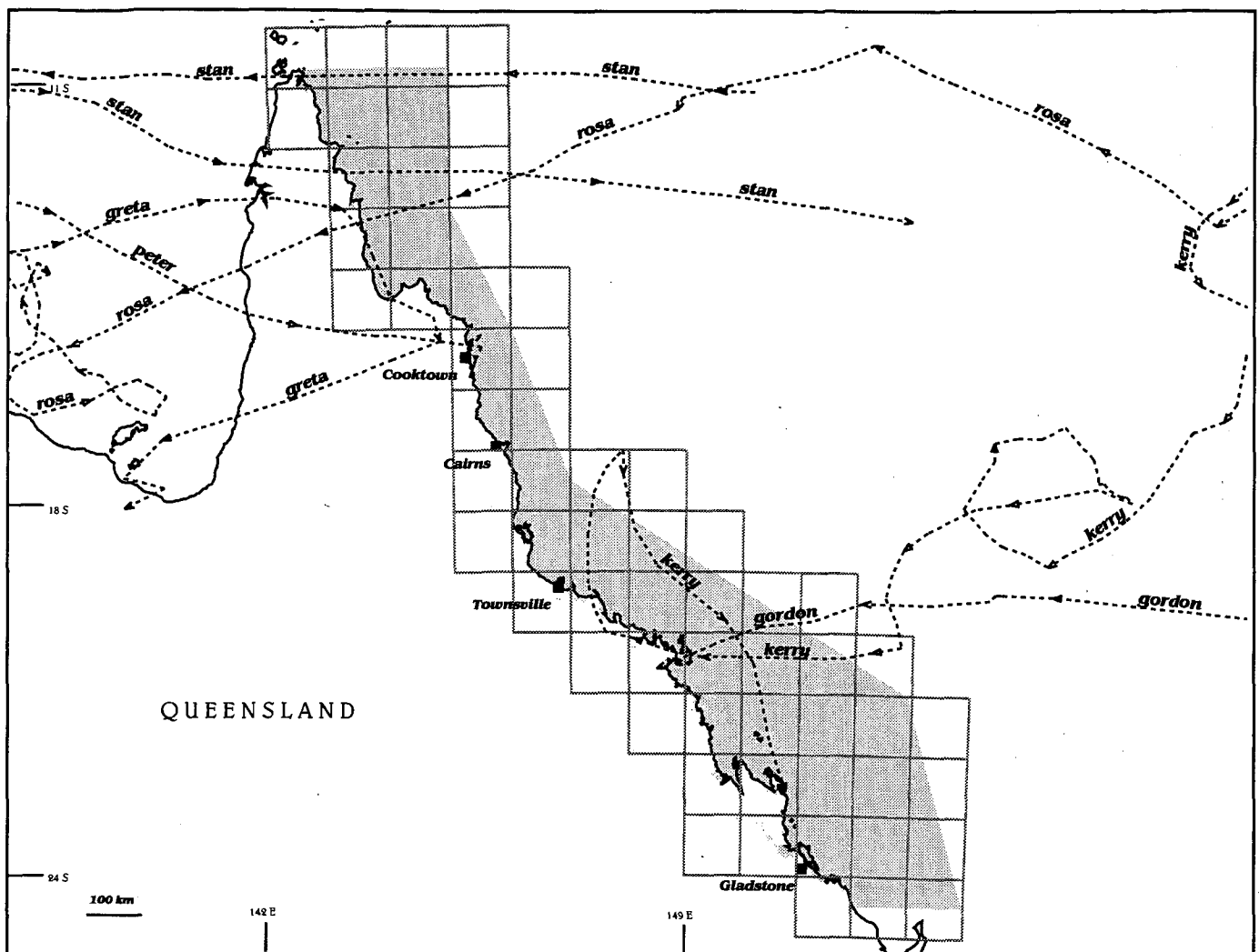
Map 75: 1977: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



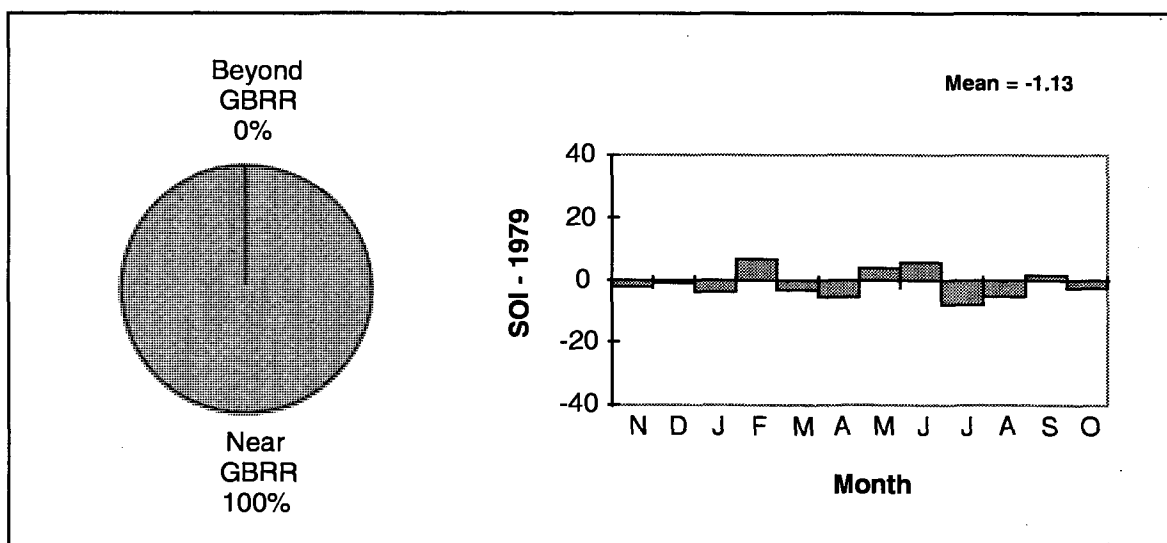
1977-1978



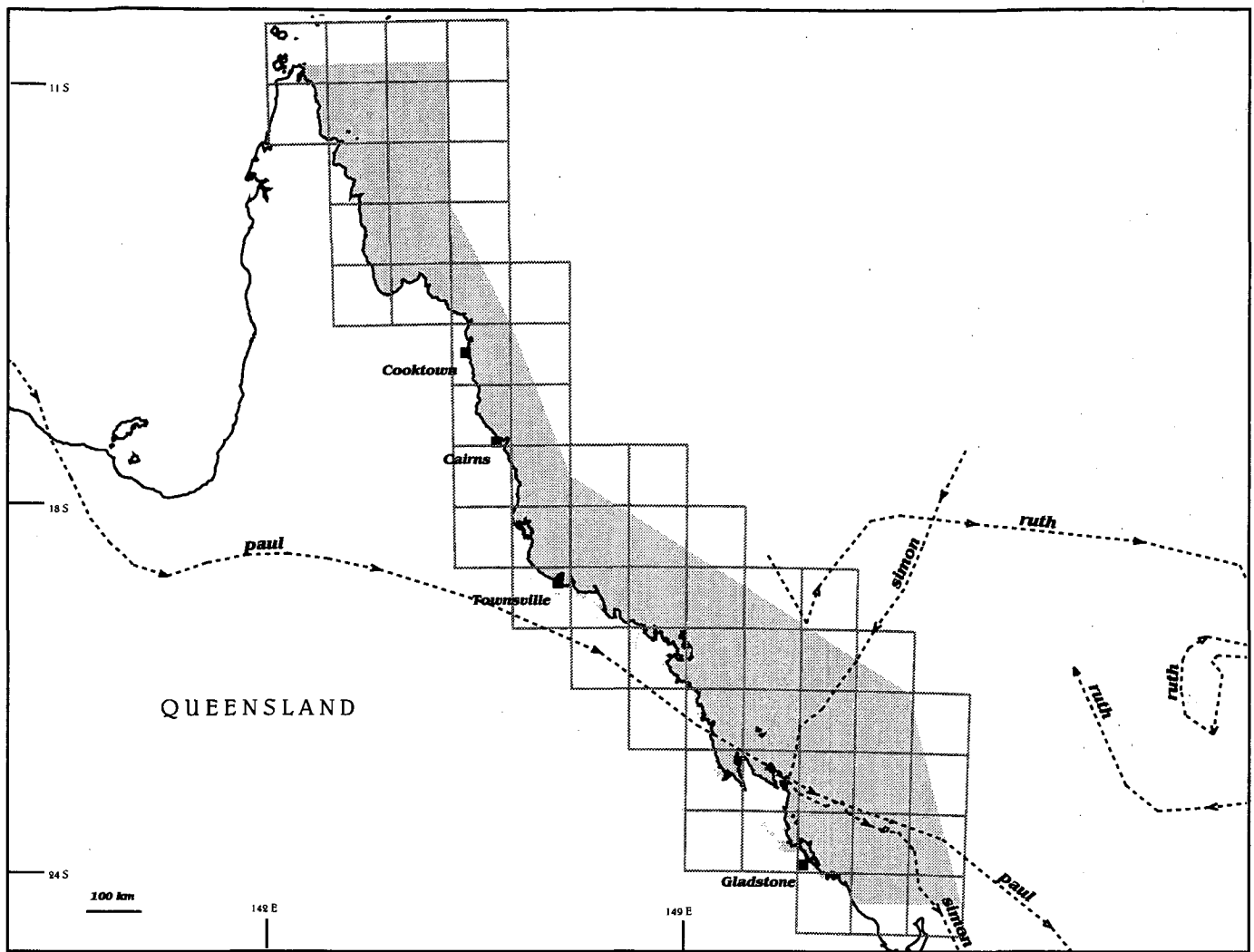
Map 76: 1978: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



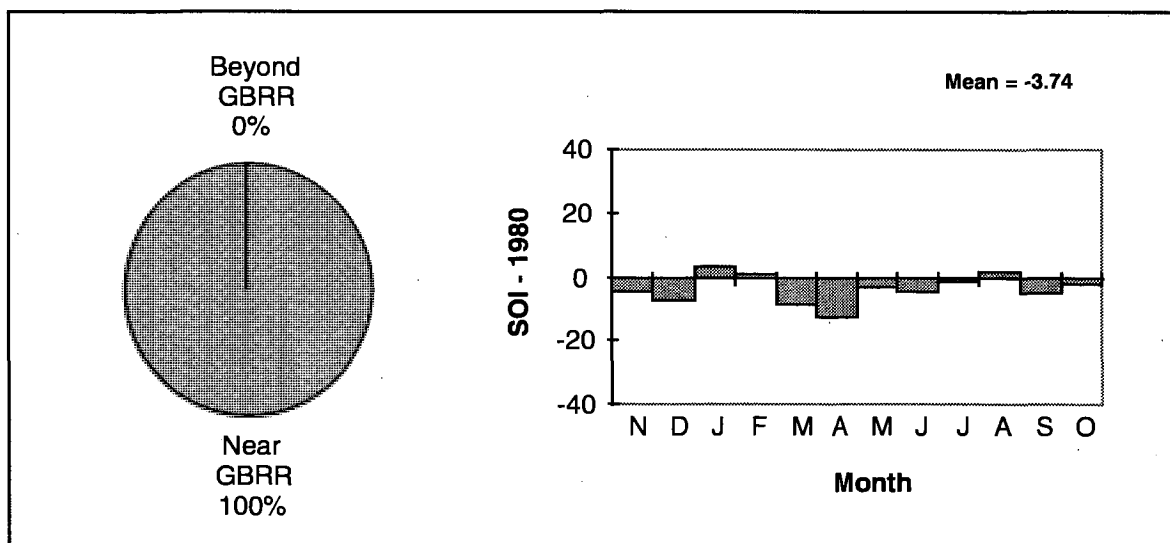
1978-1979



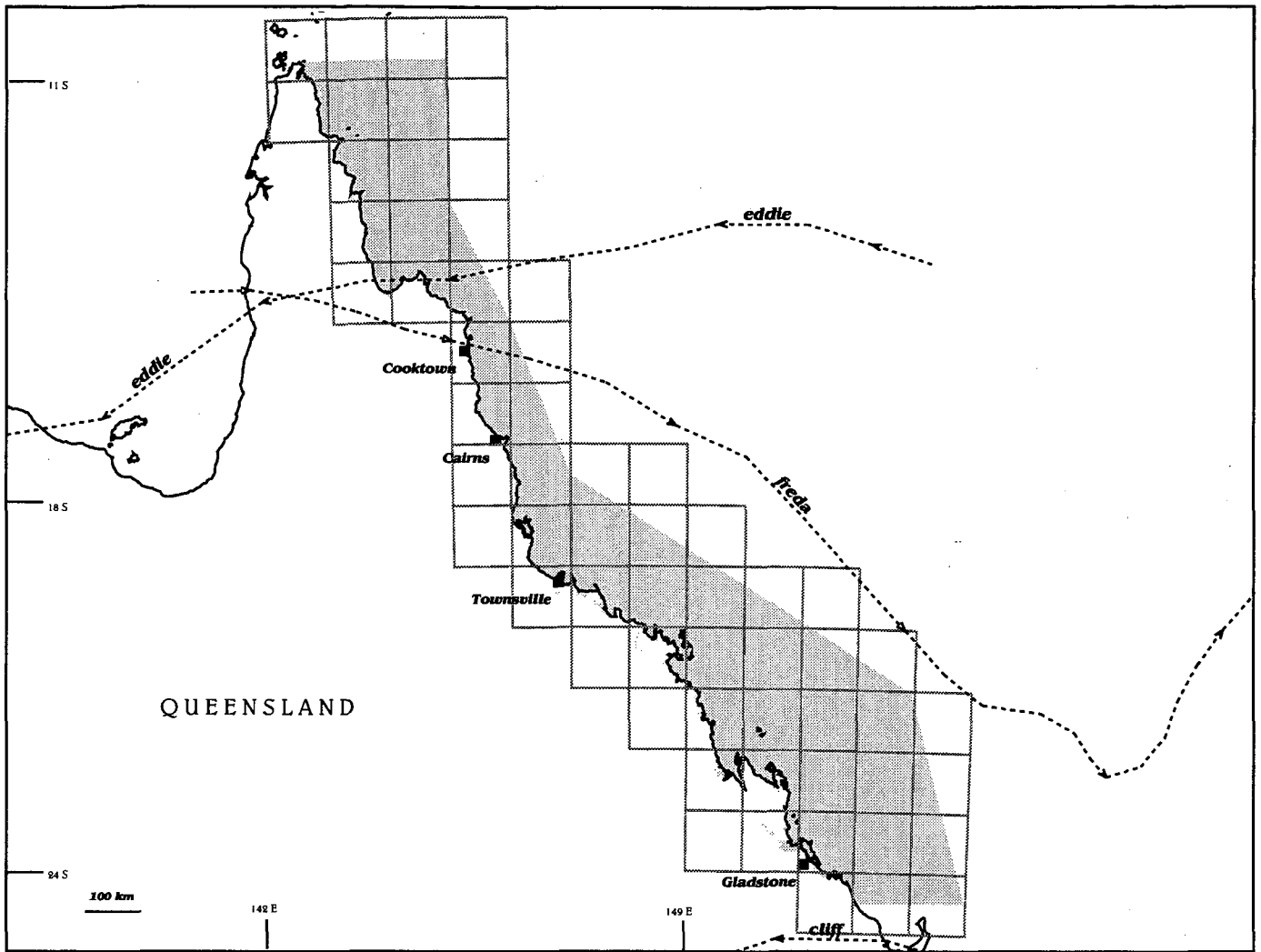
Map 77: 1979: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



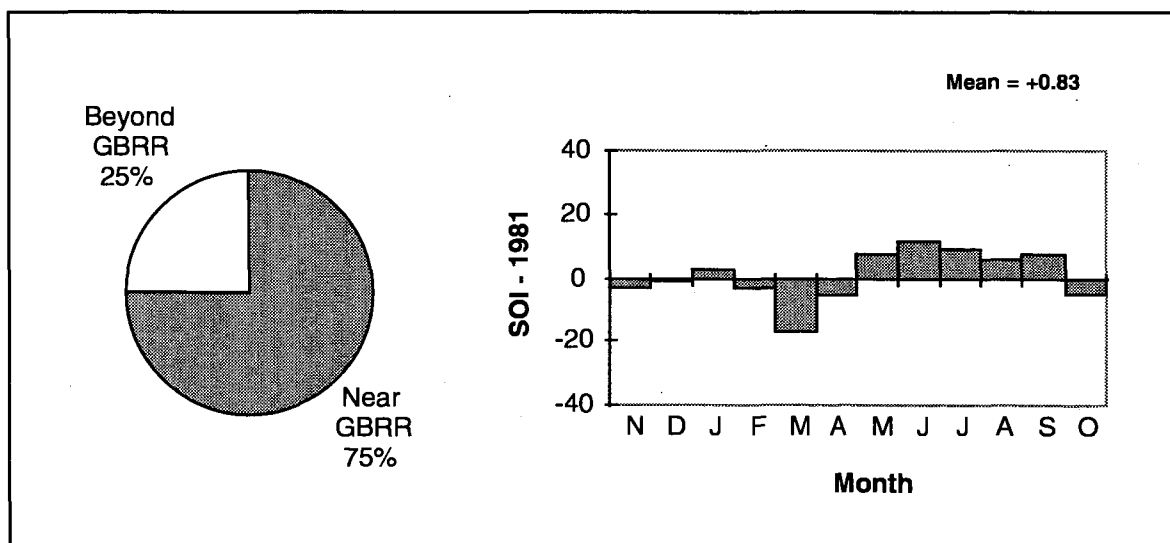
1979-1980



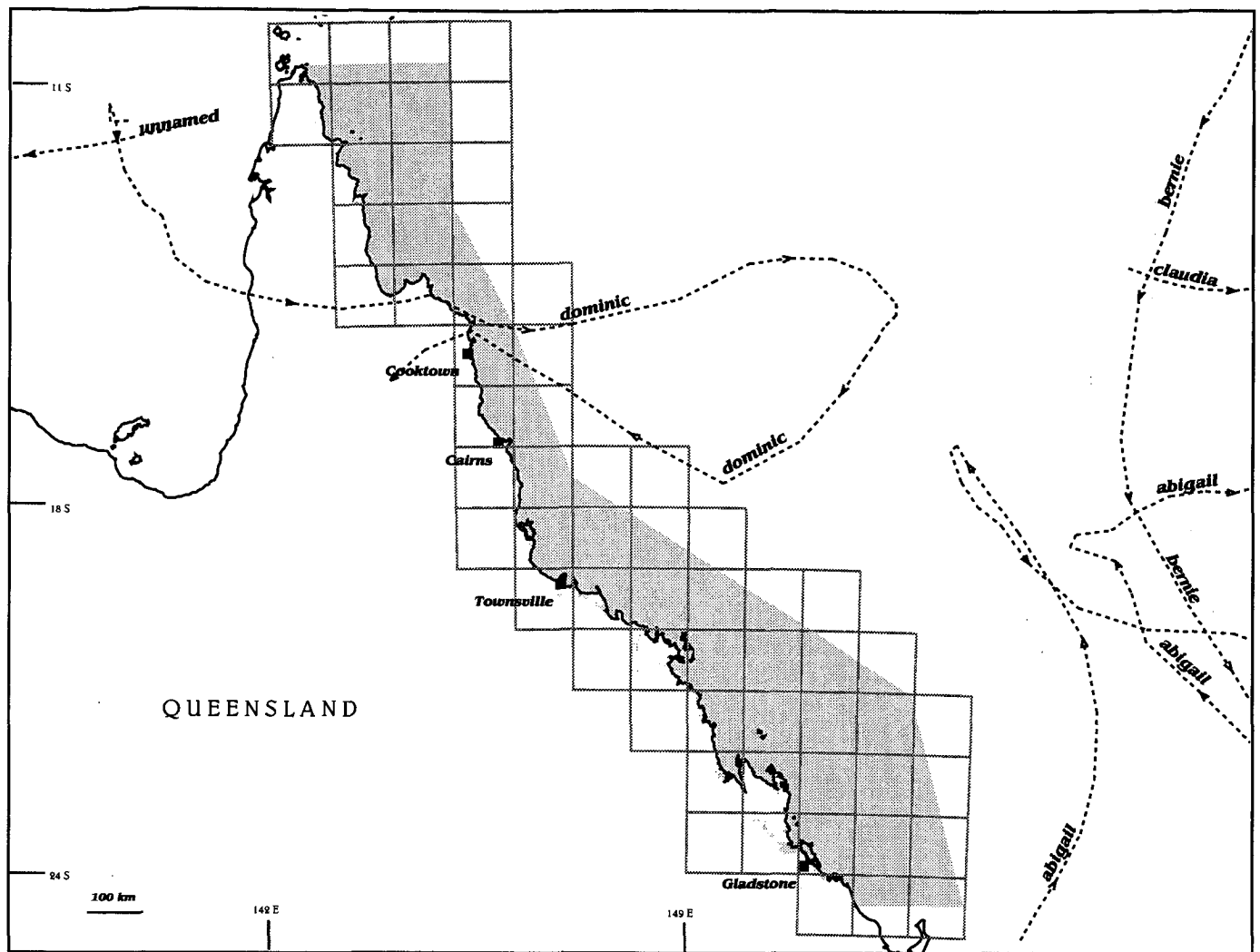
Map 78: 1980: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



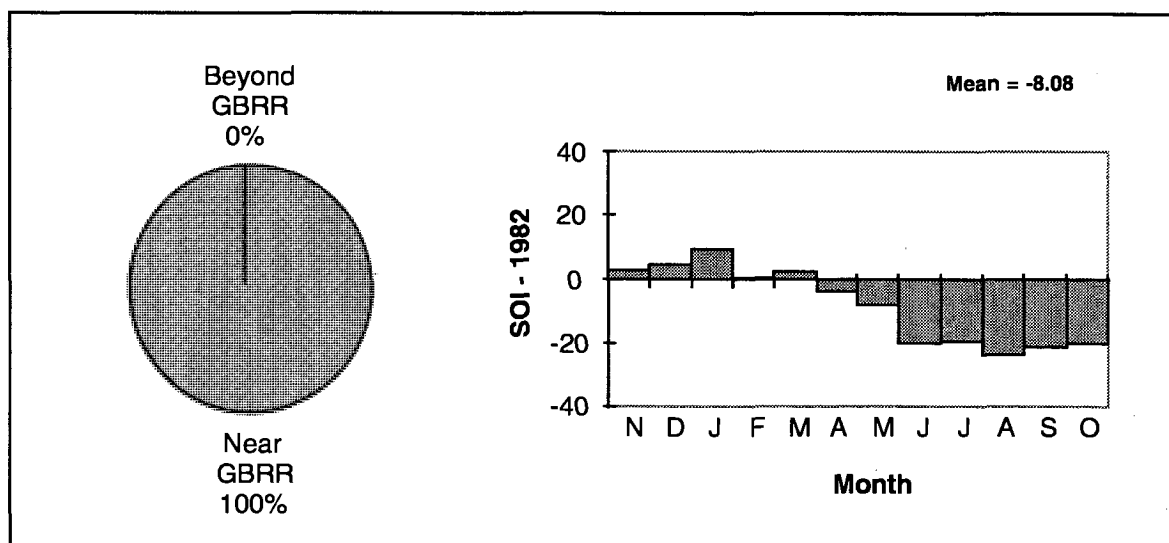
1980-1981



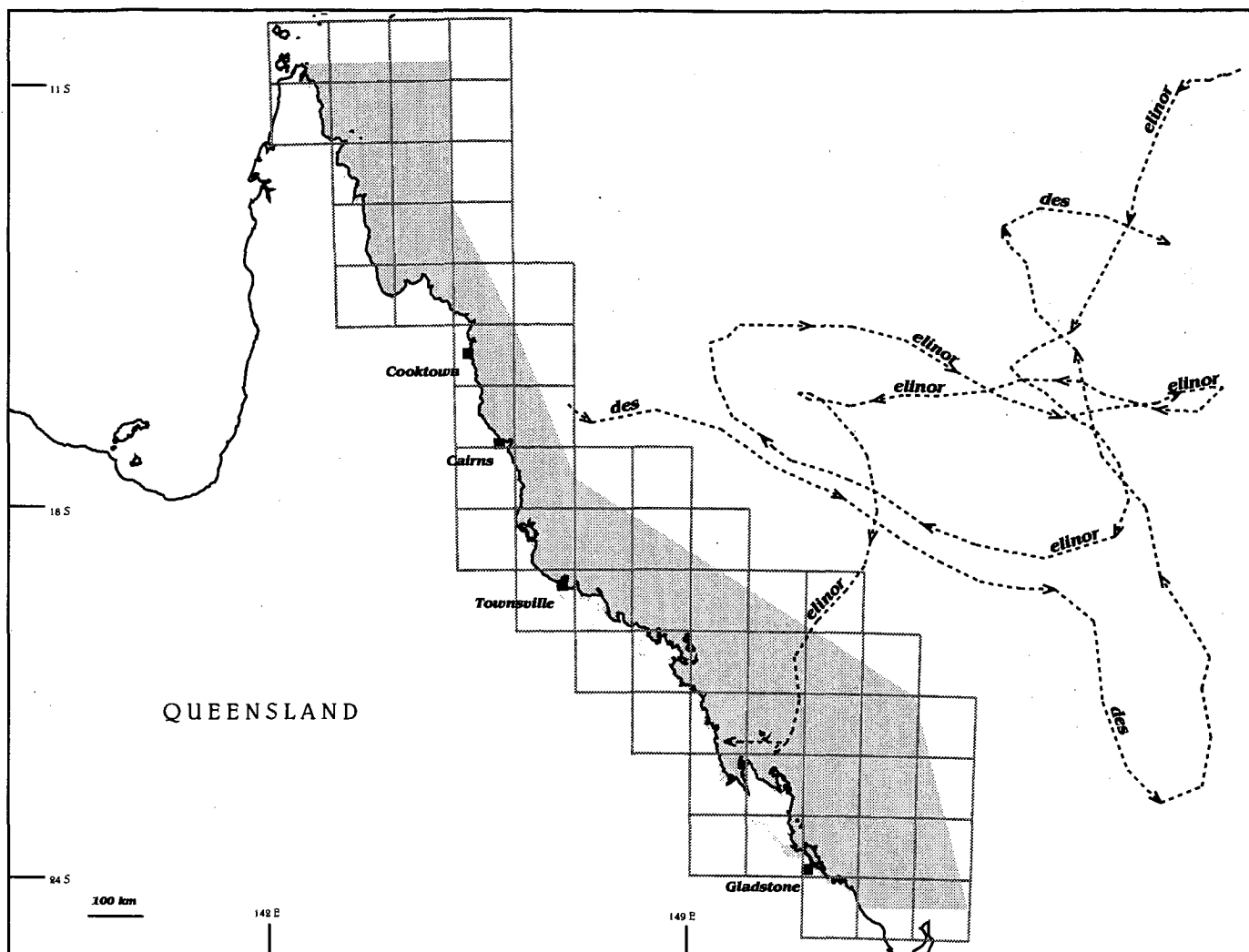
Map 79: *1981: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.*



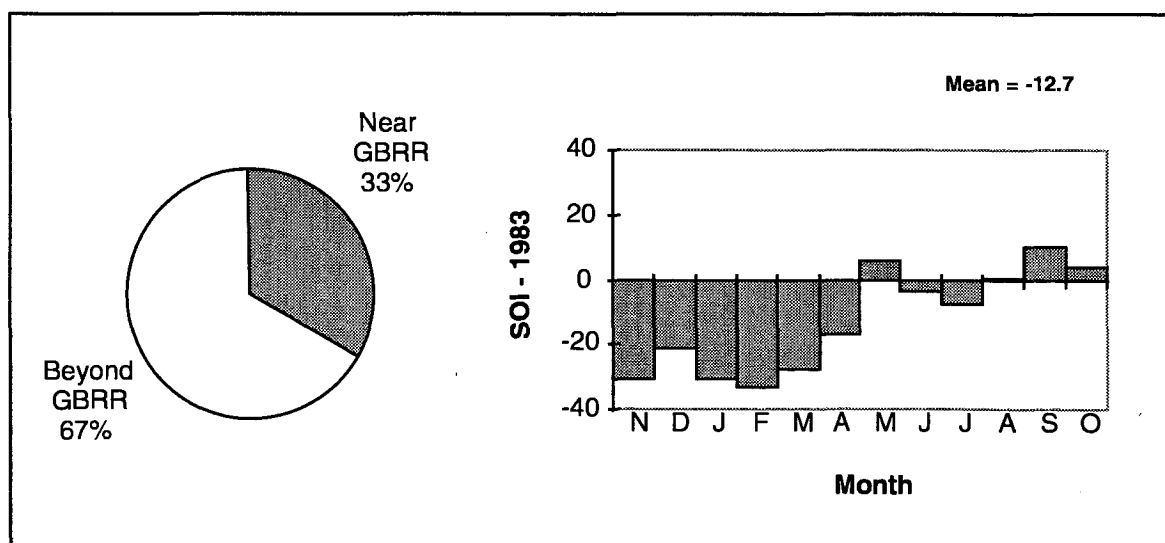
1981-1982



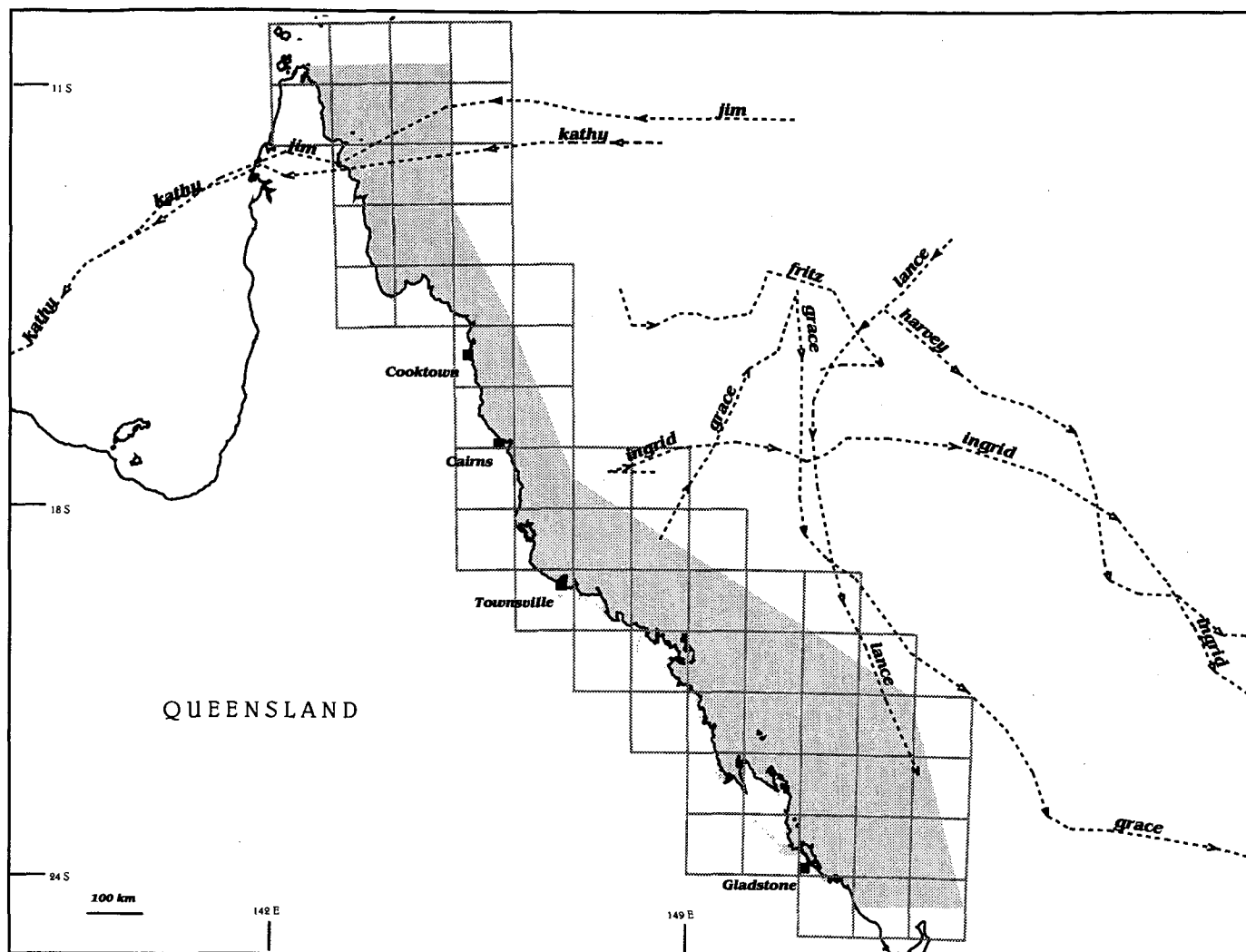
Map 80: 1982: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



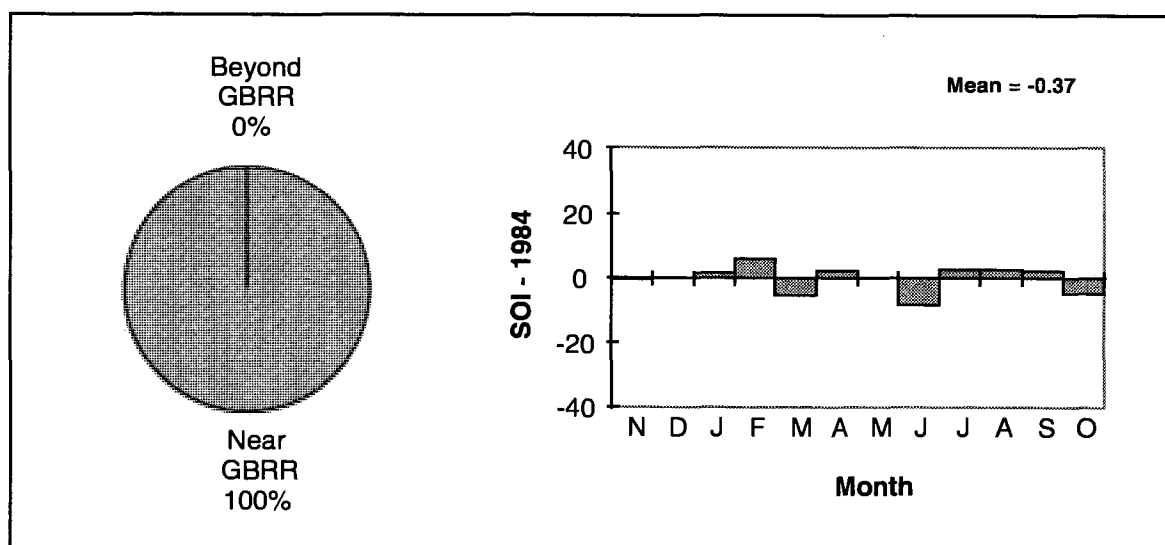
1982-1983



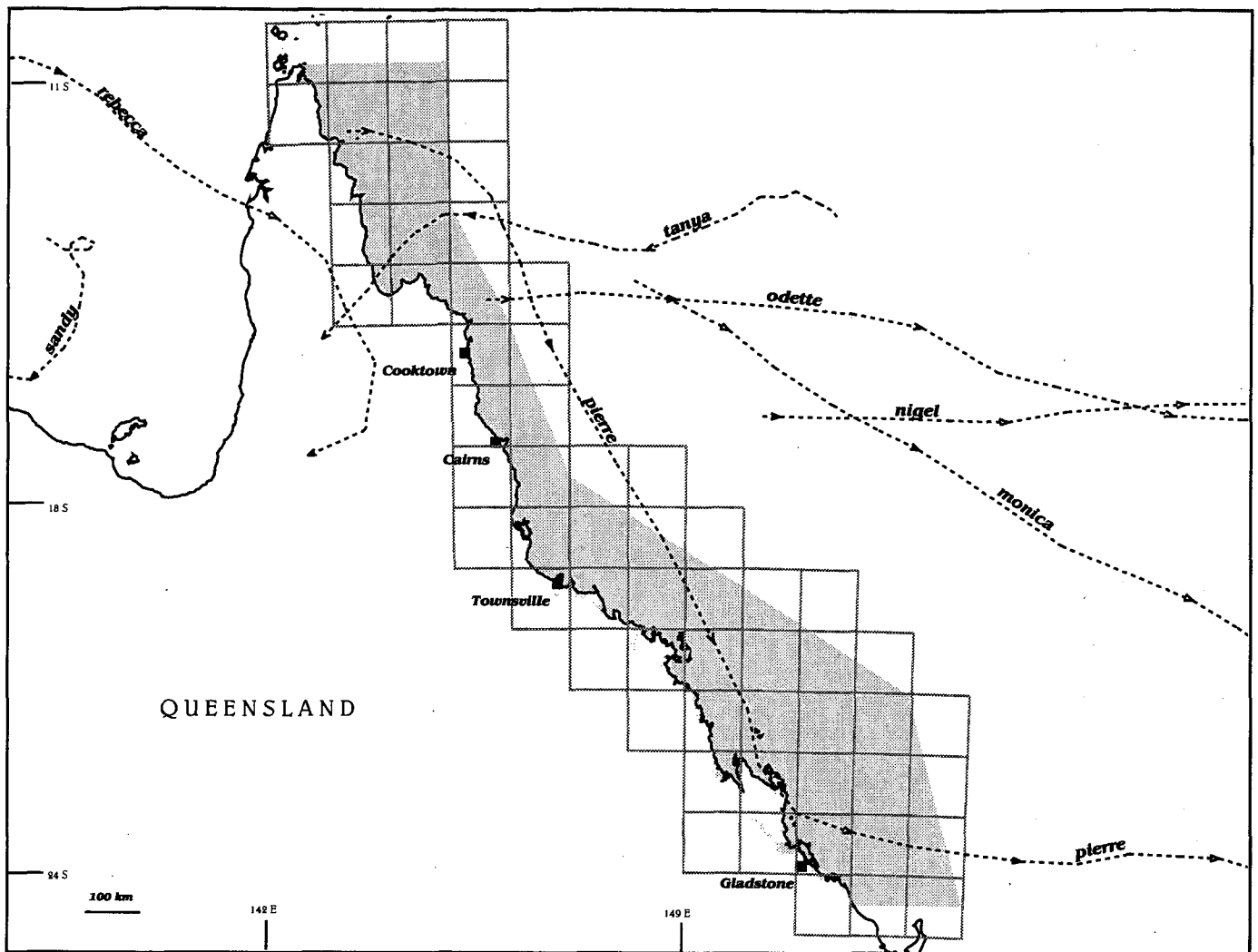
Map 81: 1983: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



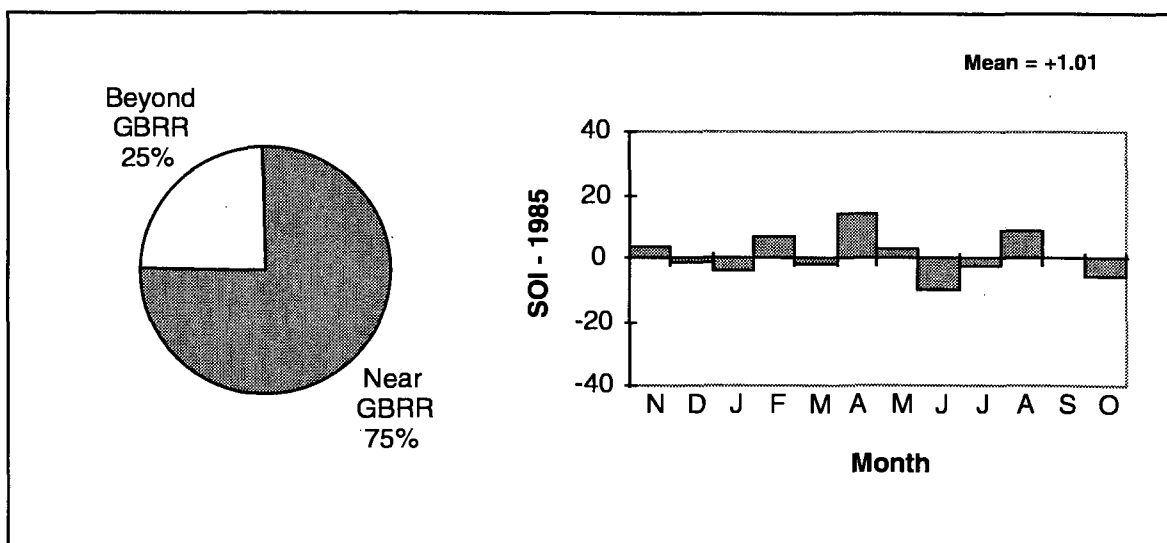
1983-1984



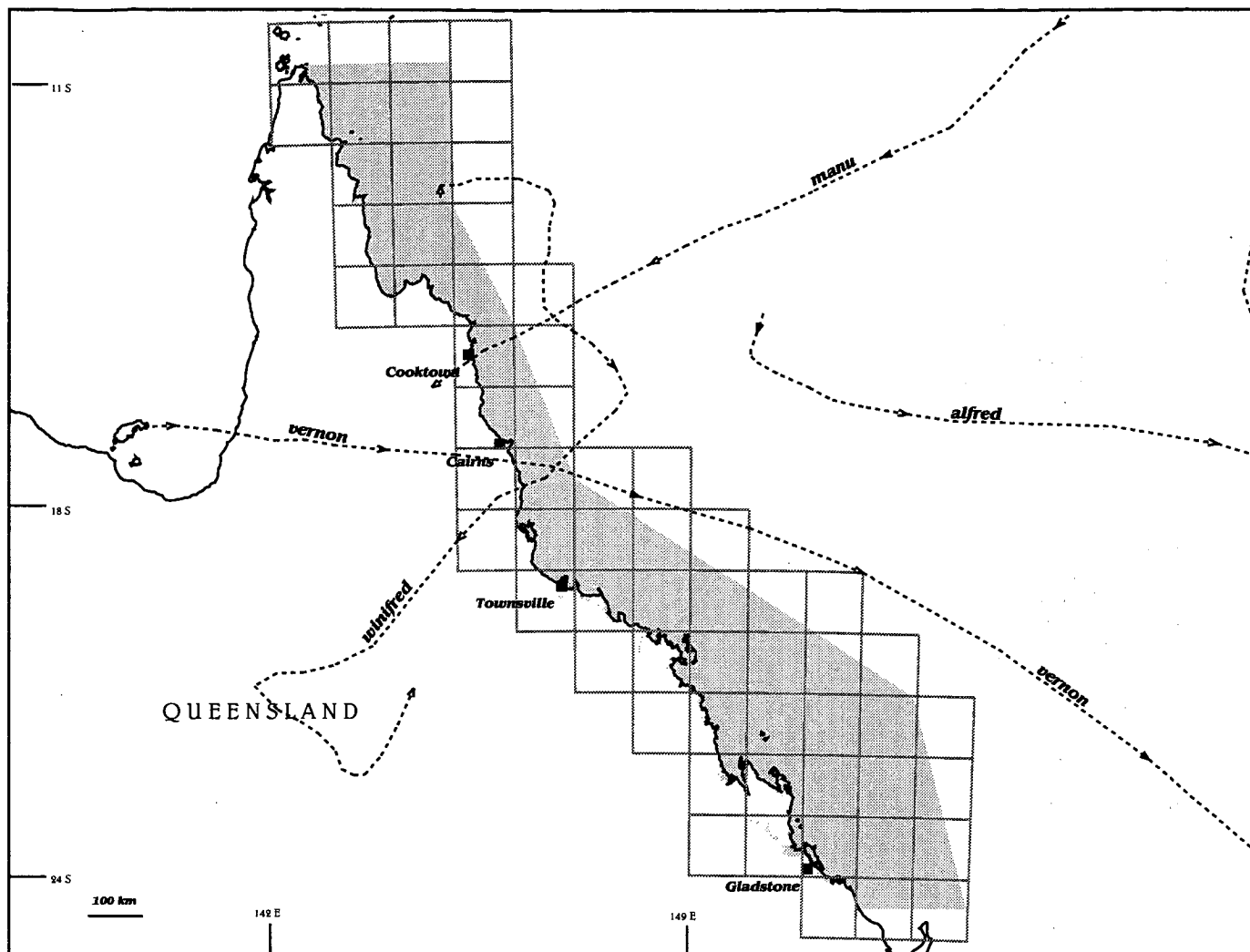
Map 82 : 1984: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



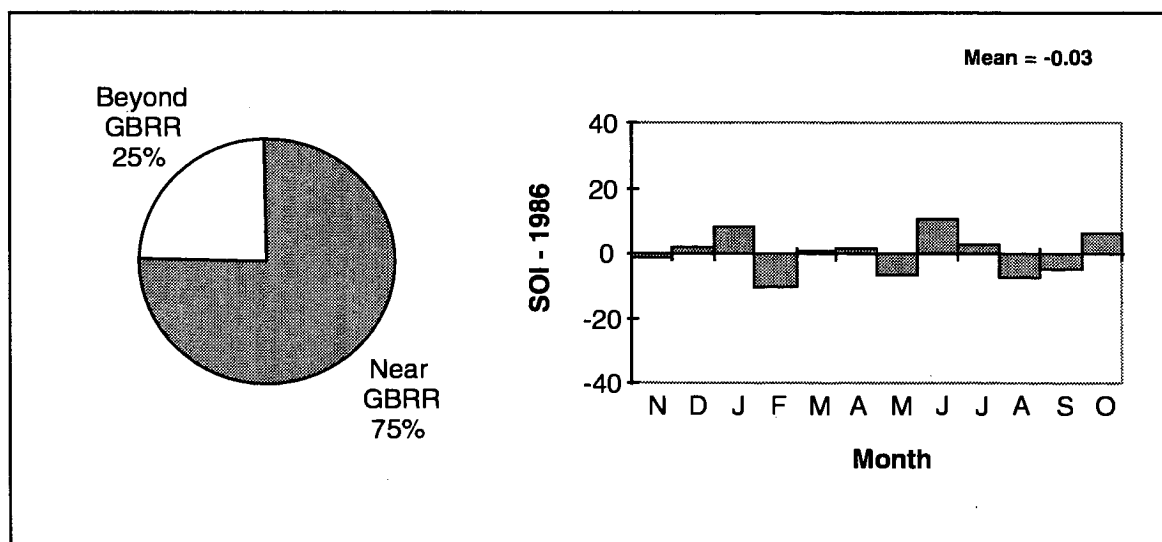
1984-1985



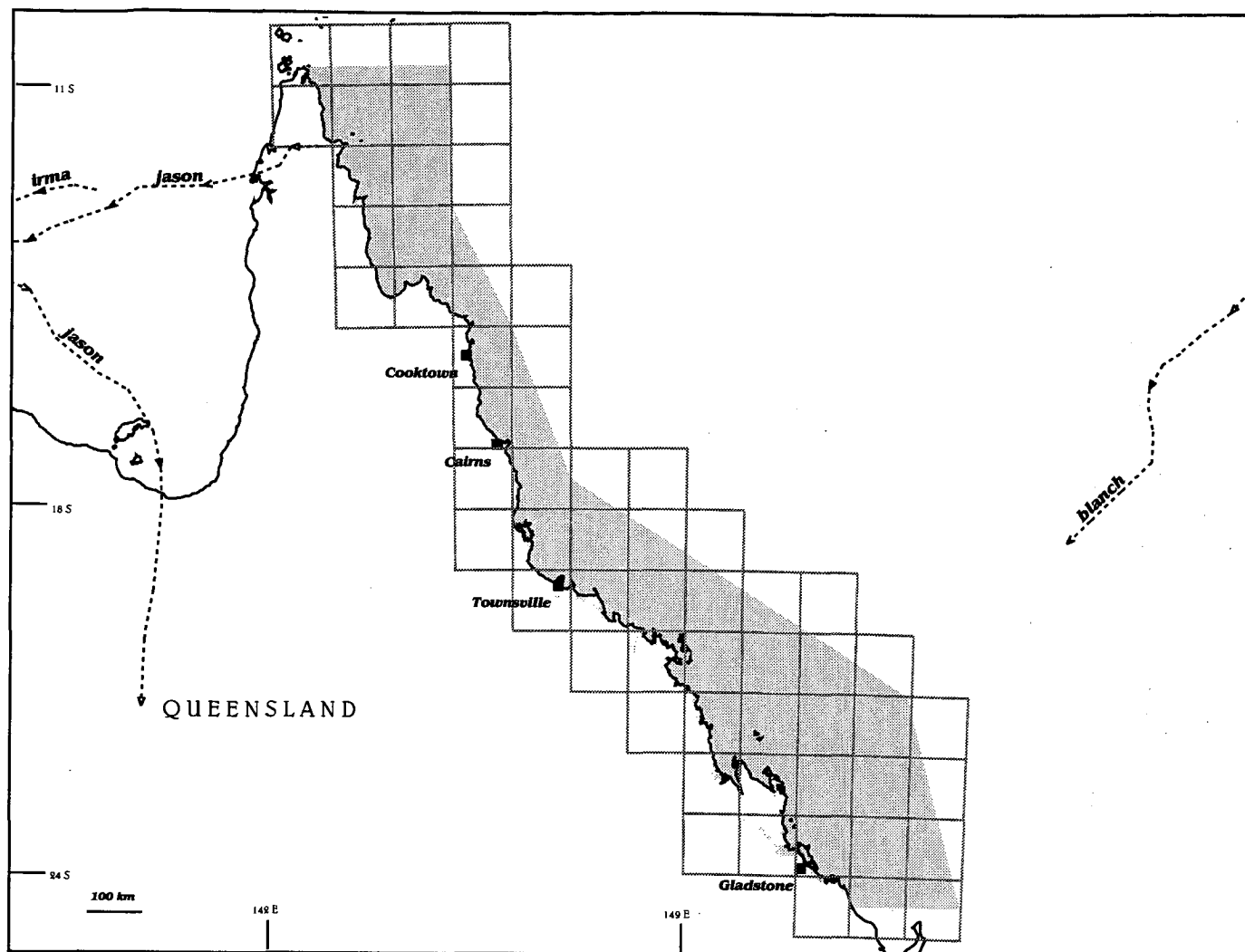
Map 83: 1985: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



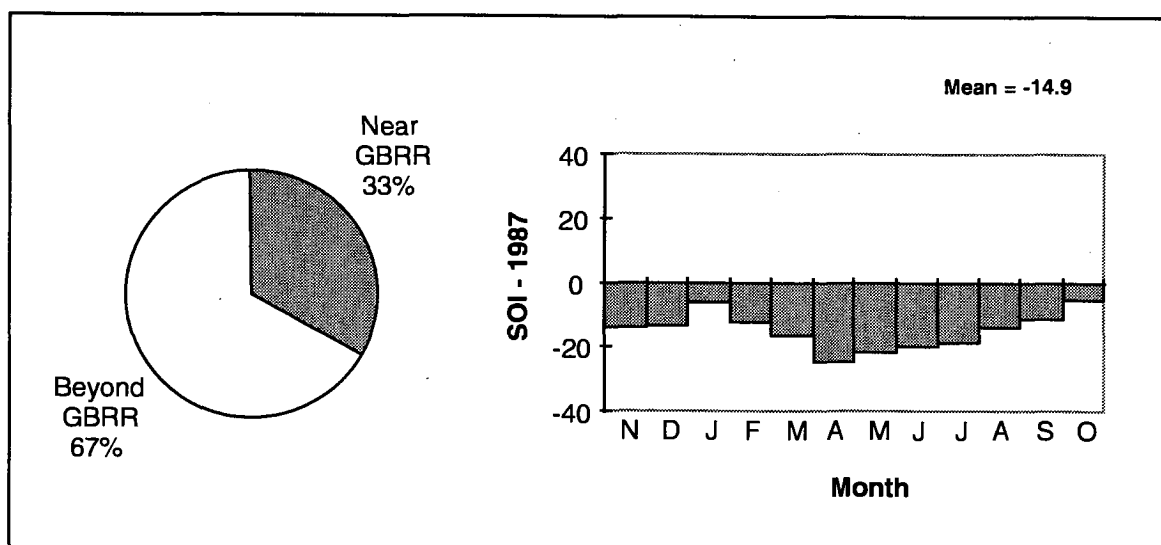
1985-1986



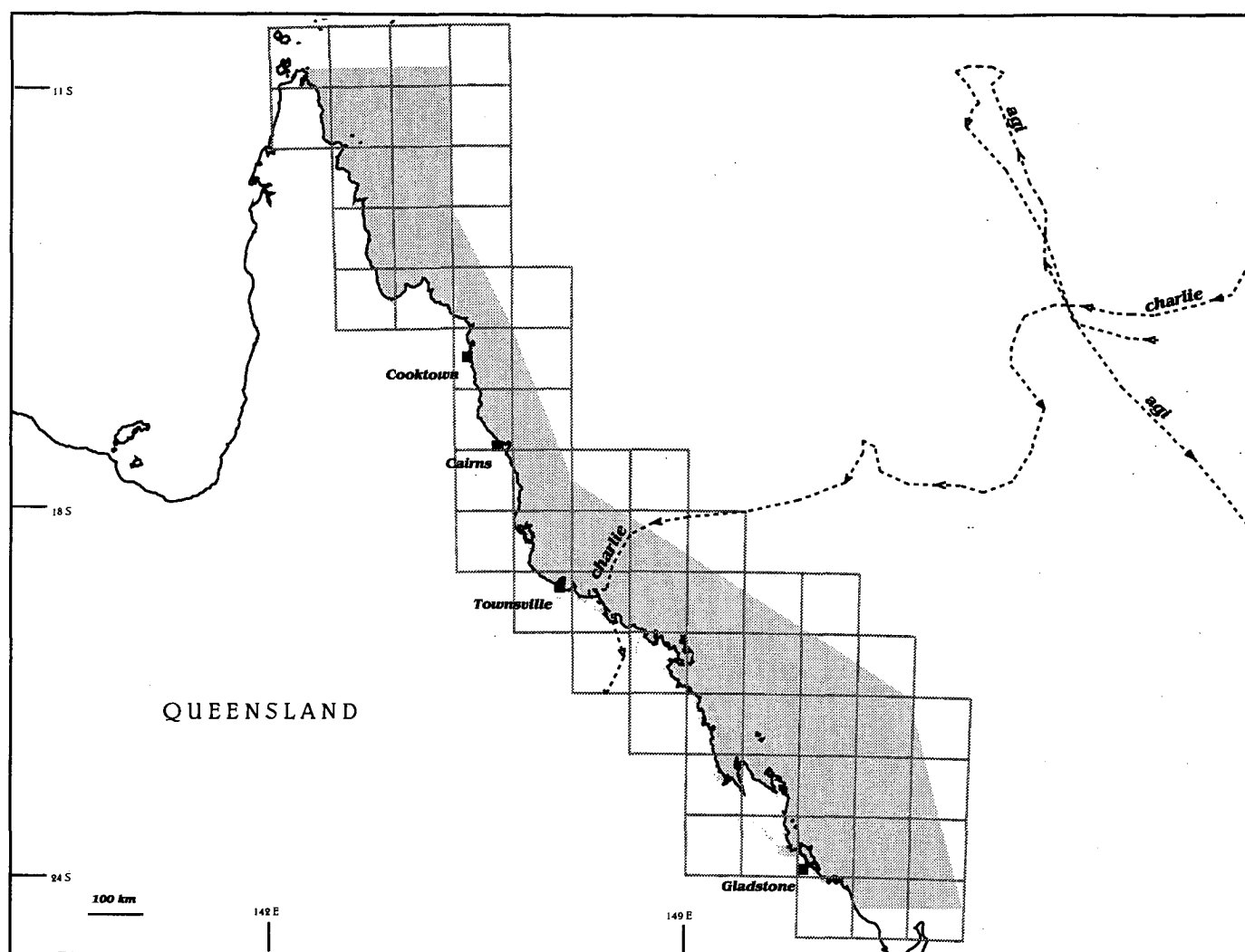
Map 84: 1986: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



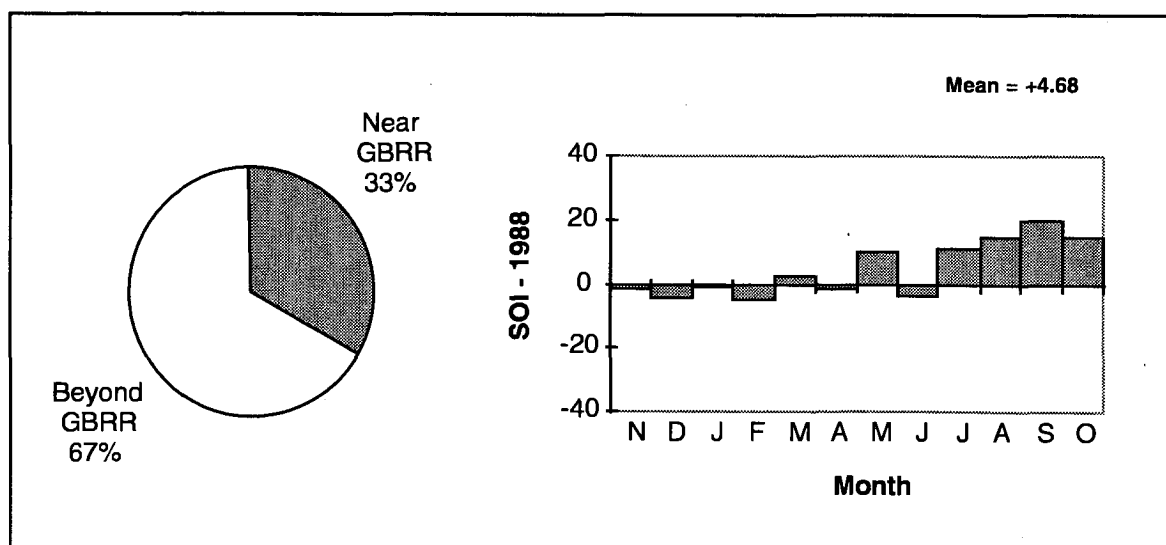
1986-1987



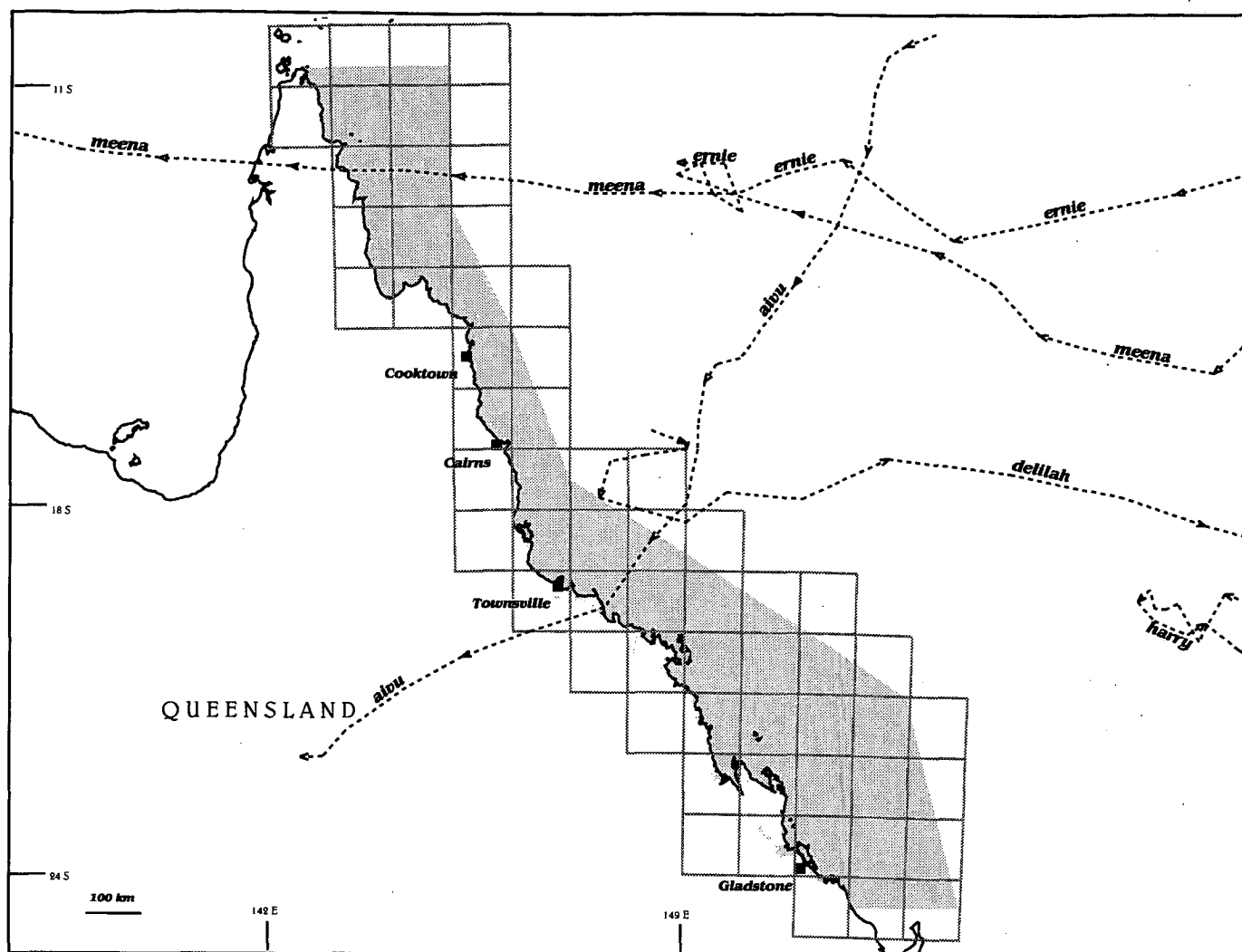
Map 85: 1987: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



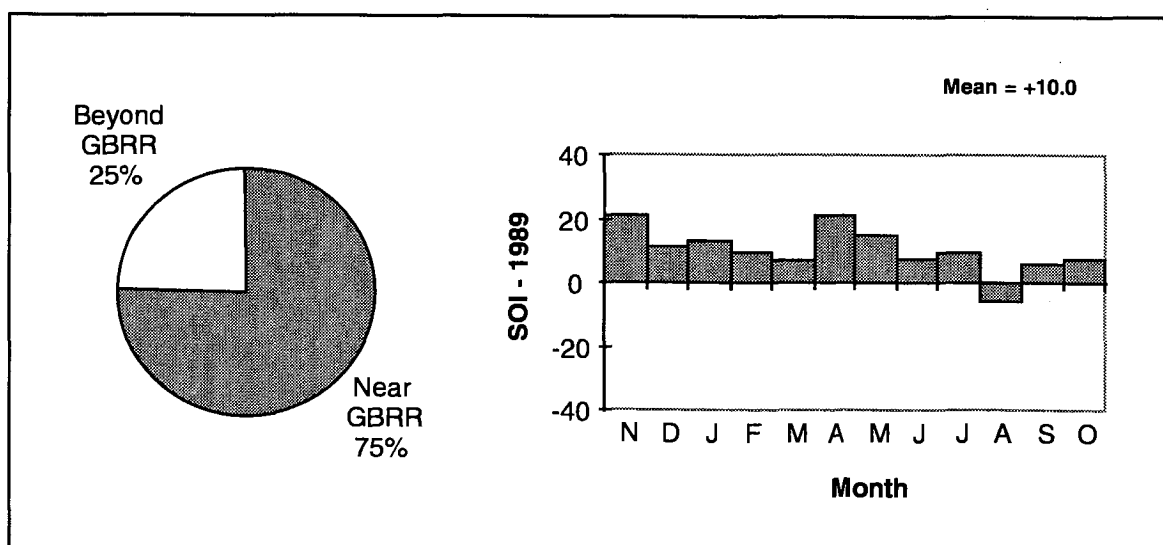
1987-1988



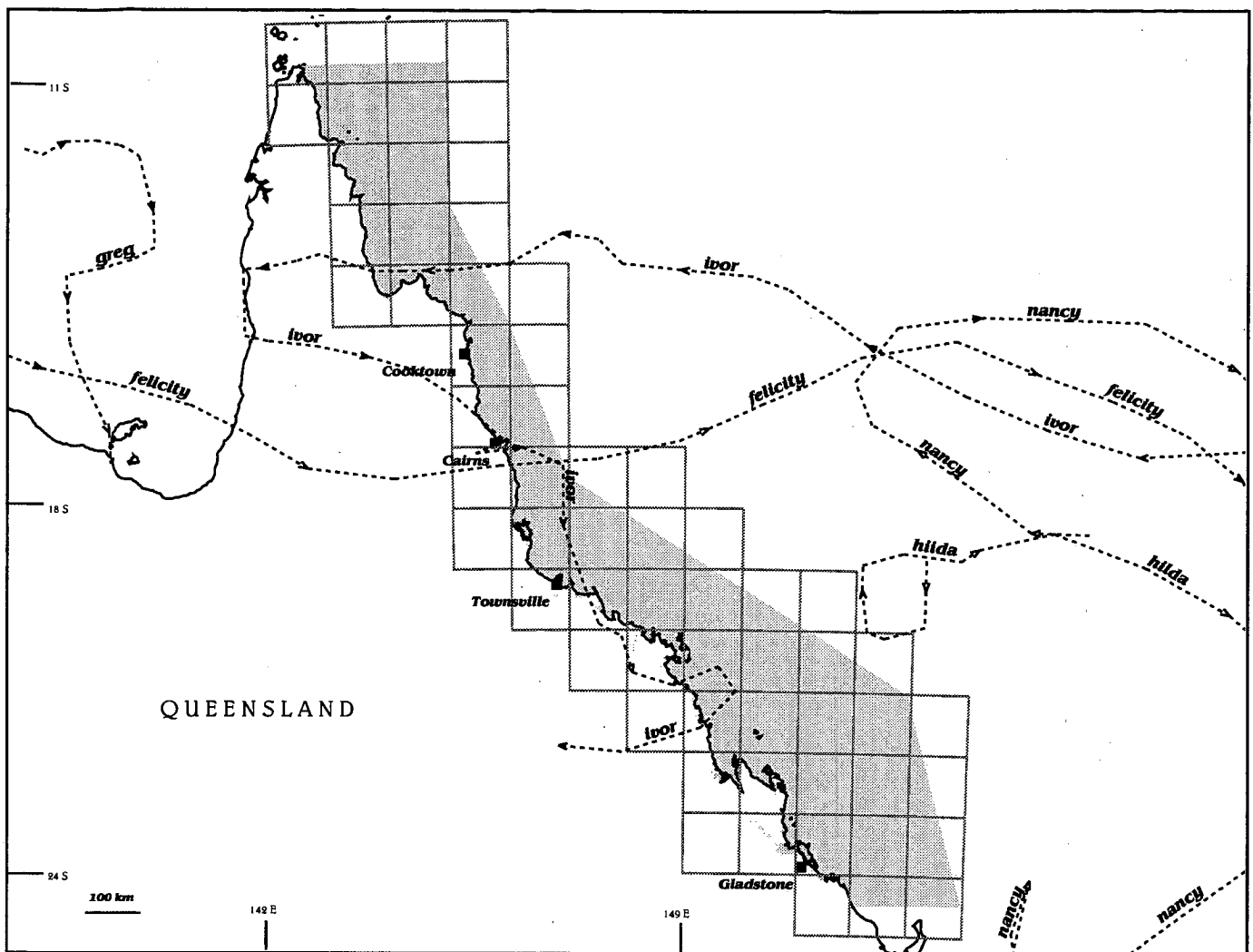
Map 86: 1988: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



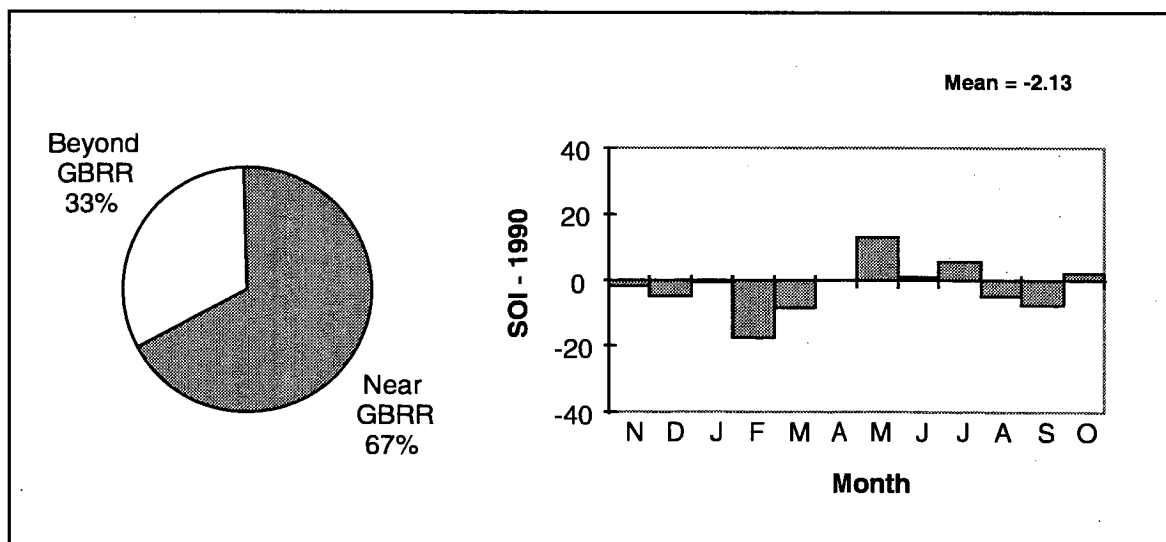
1988-1989



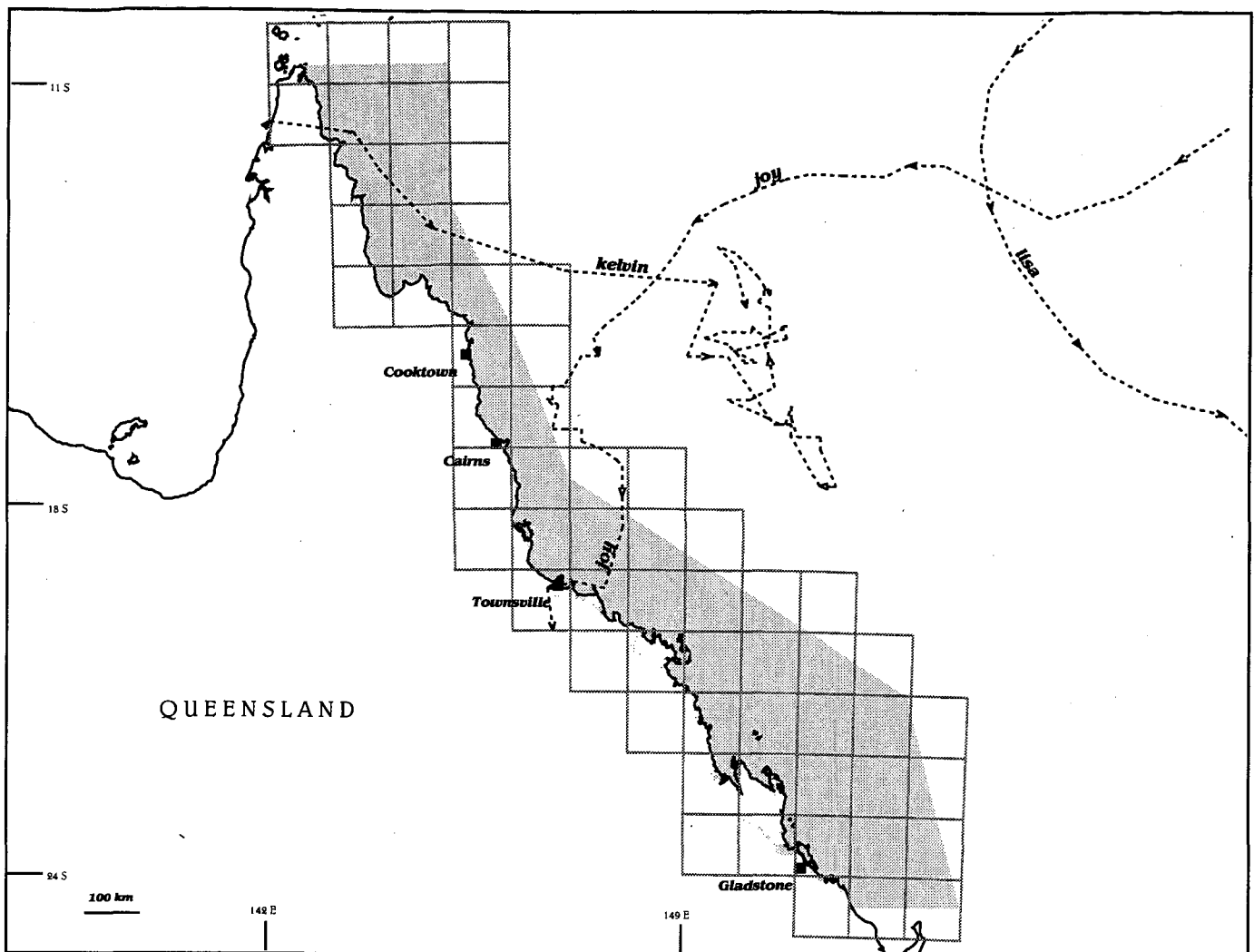
Map 87: 1989: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



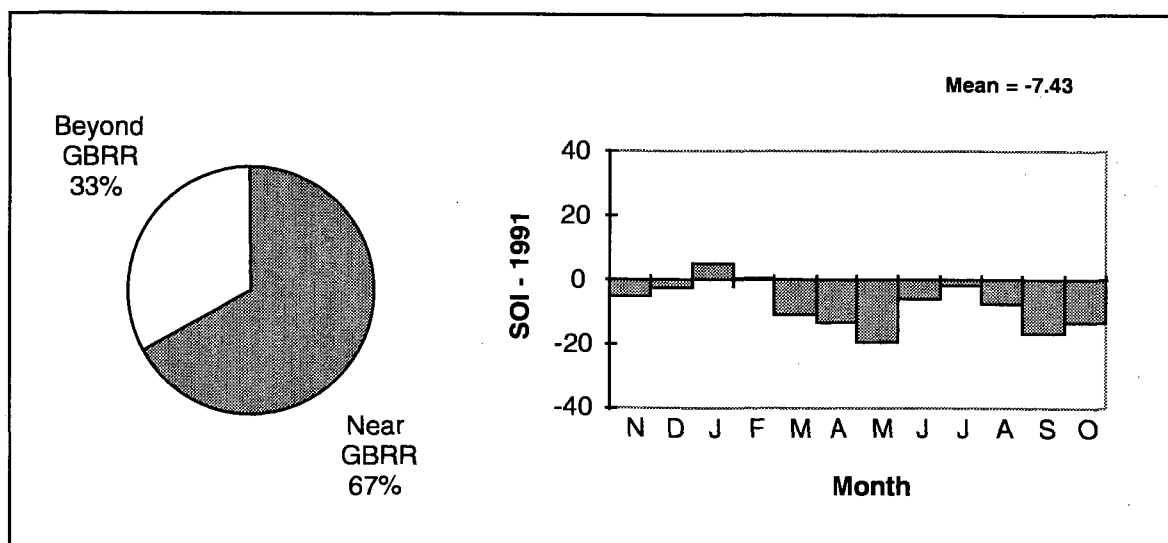
1989-1990



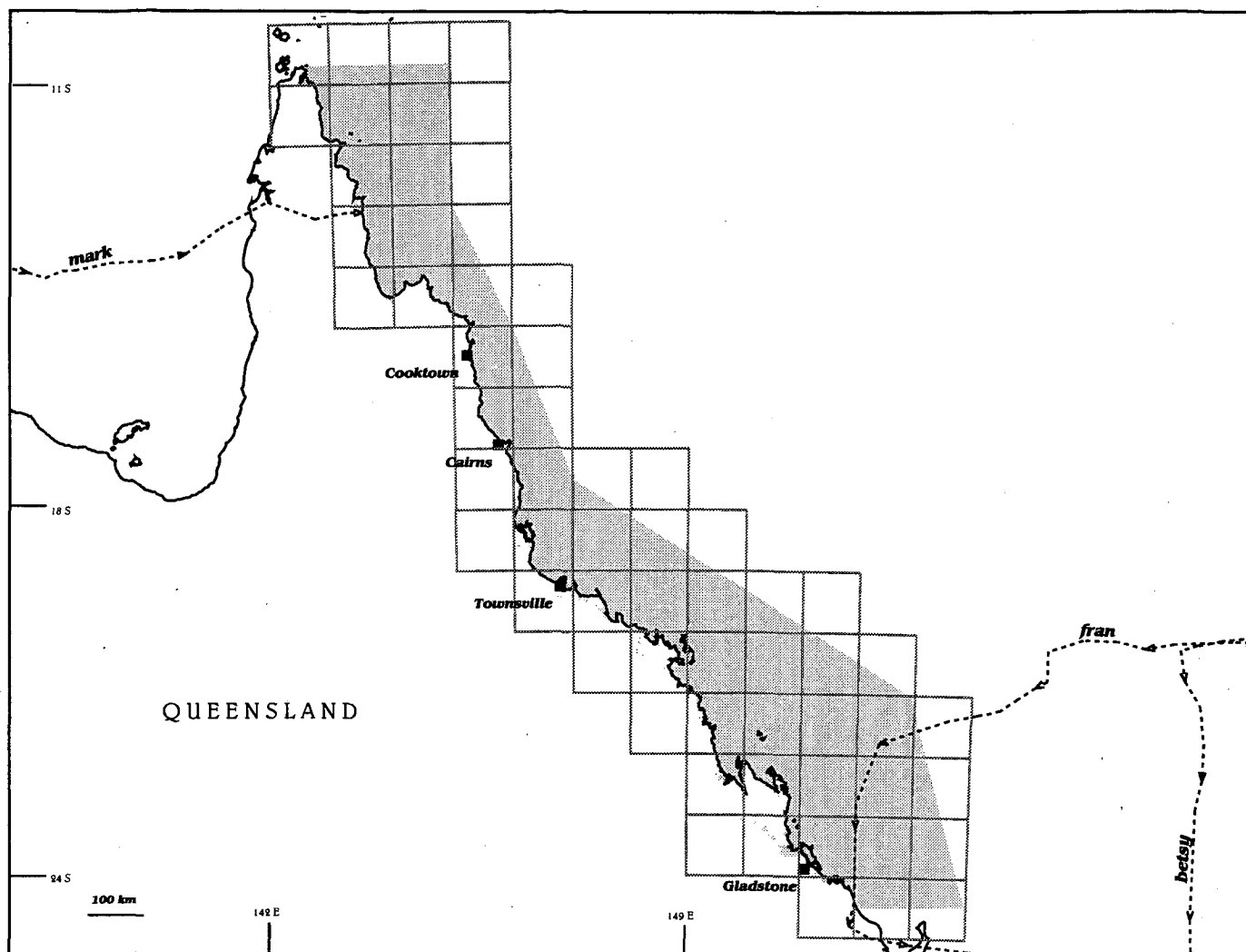
Map 88: 1990: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



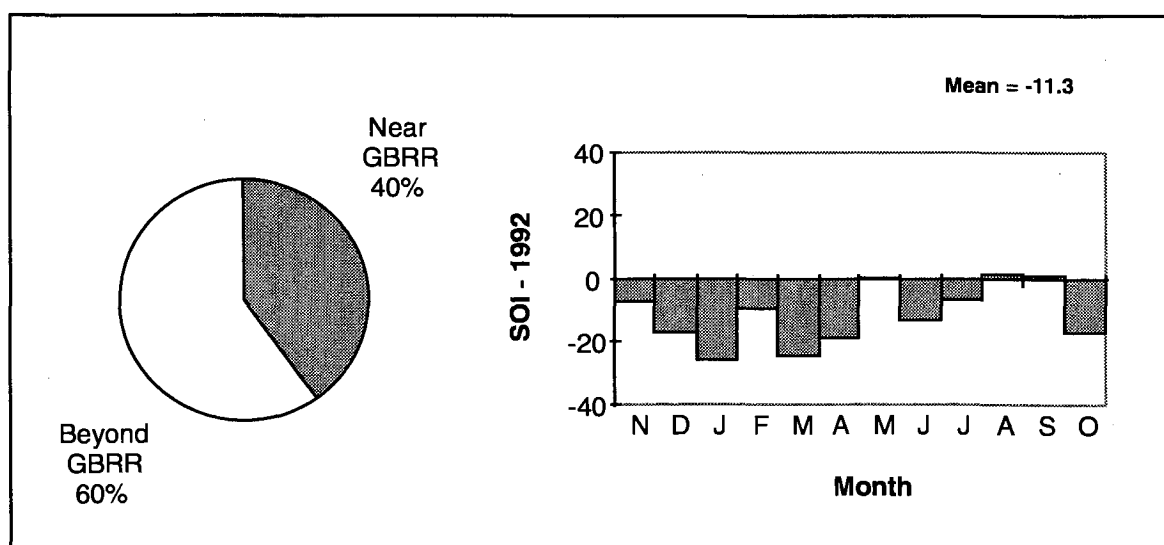
1990-1991



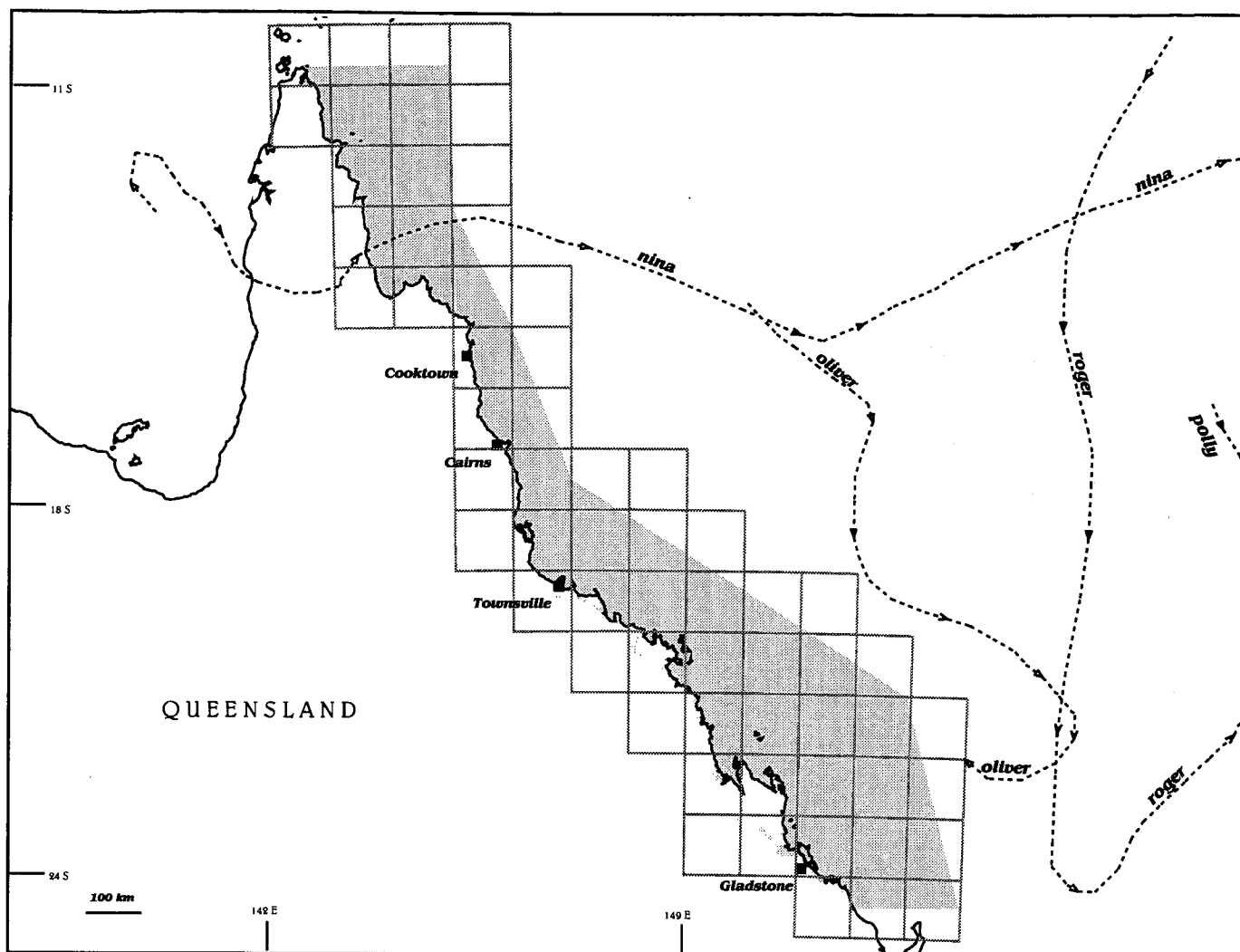
Map 89: *1991: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.*



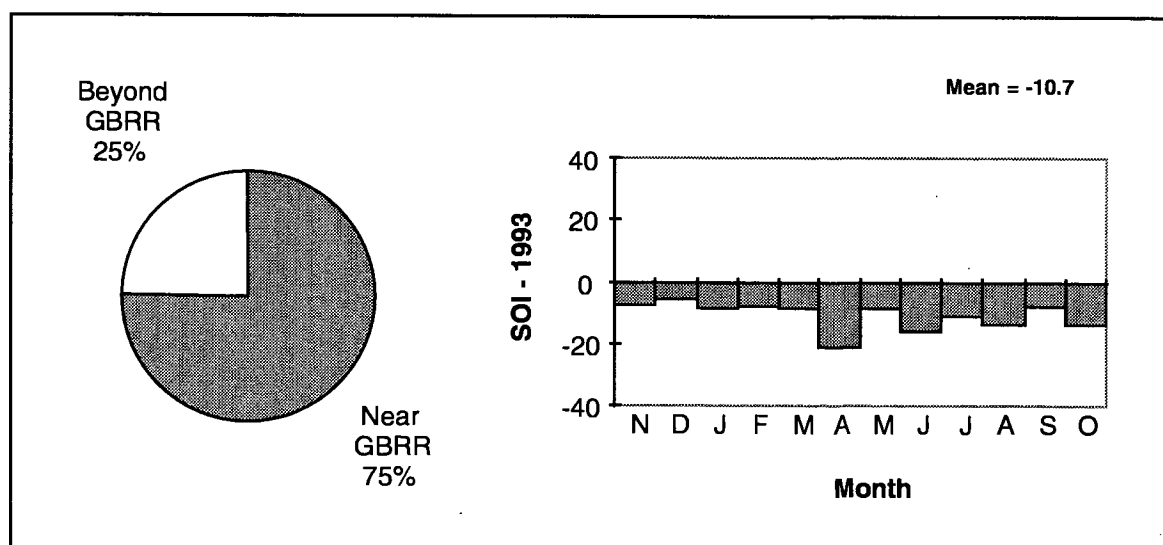
1991-1992



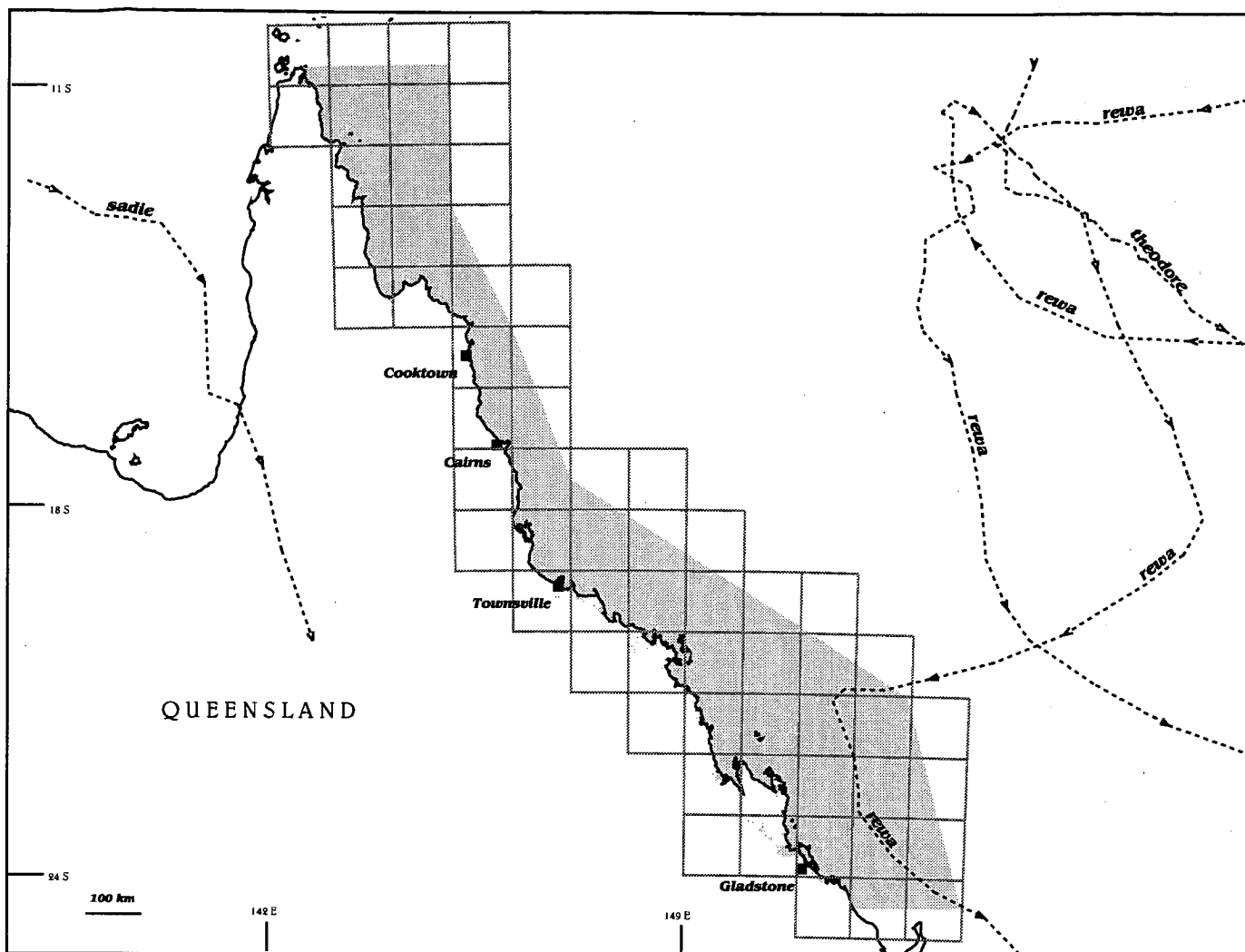
Map 90: 1992: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



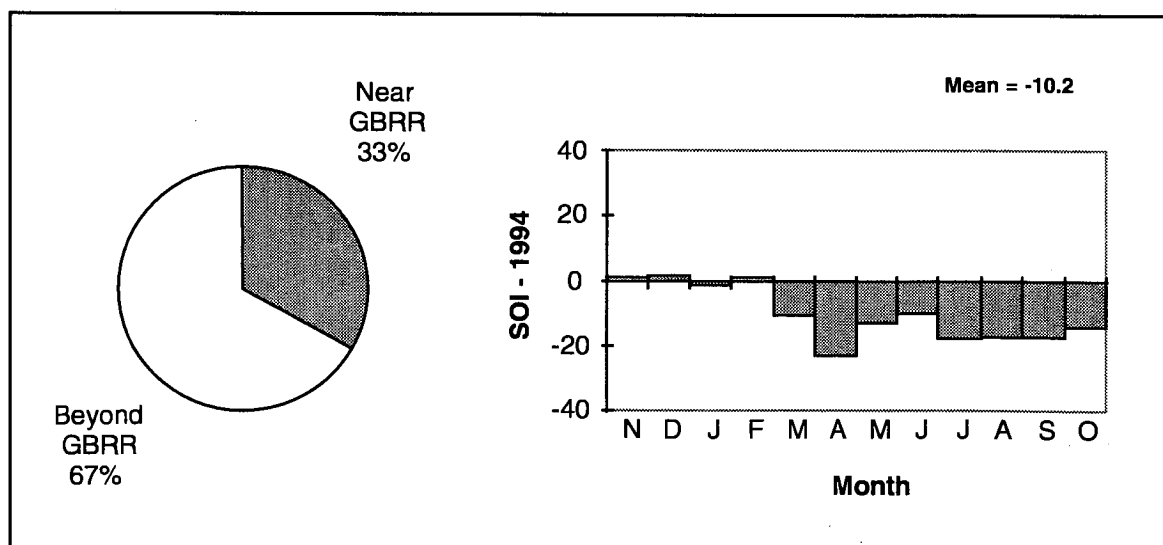
1992-1993



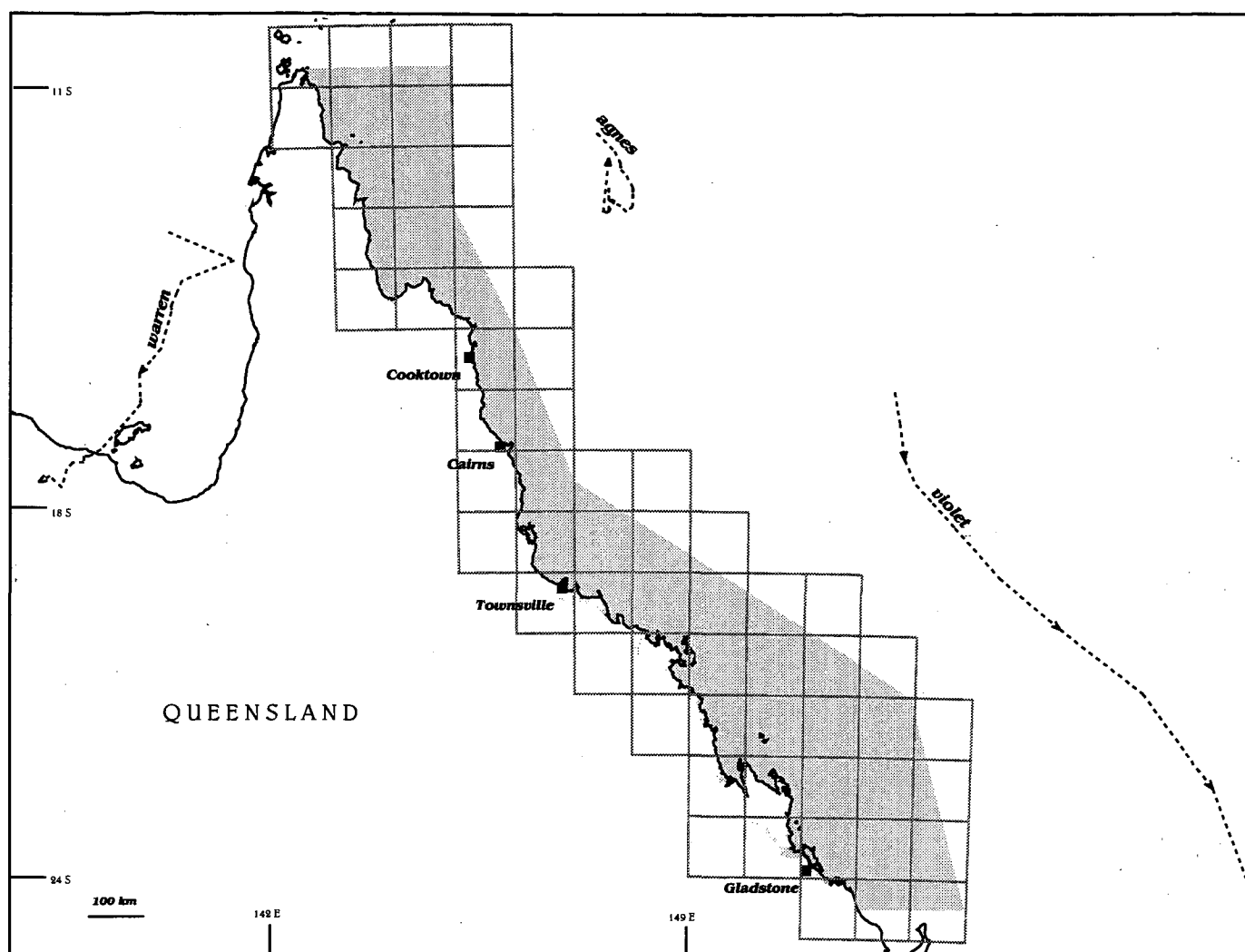
Map 91: 1993: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



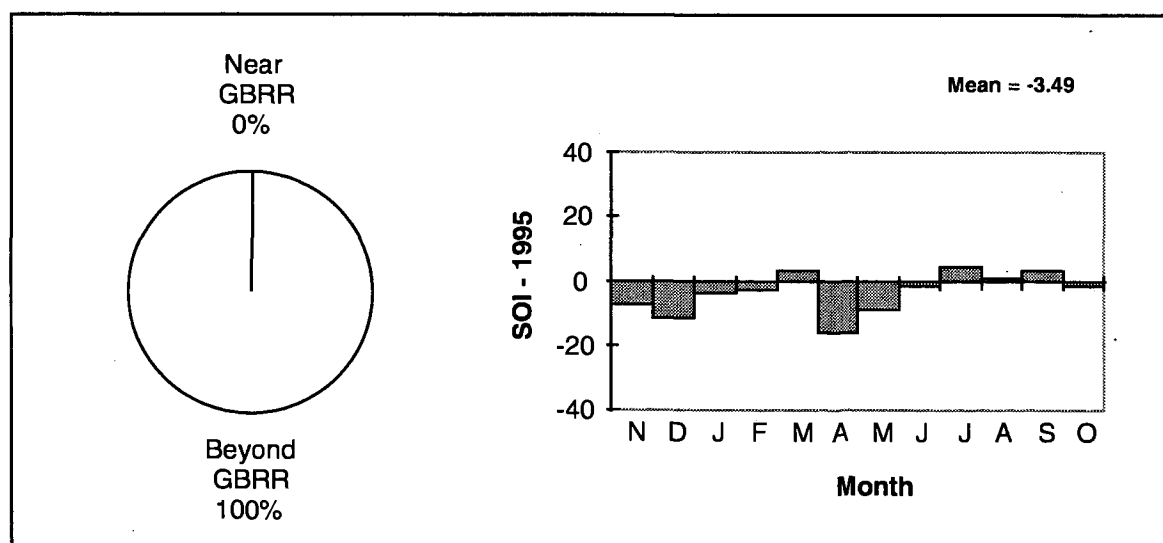
1993-1994



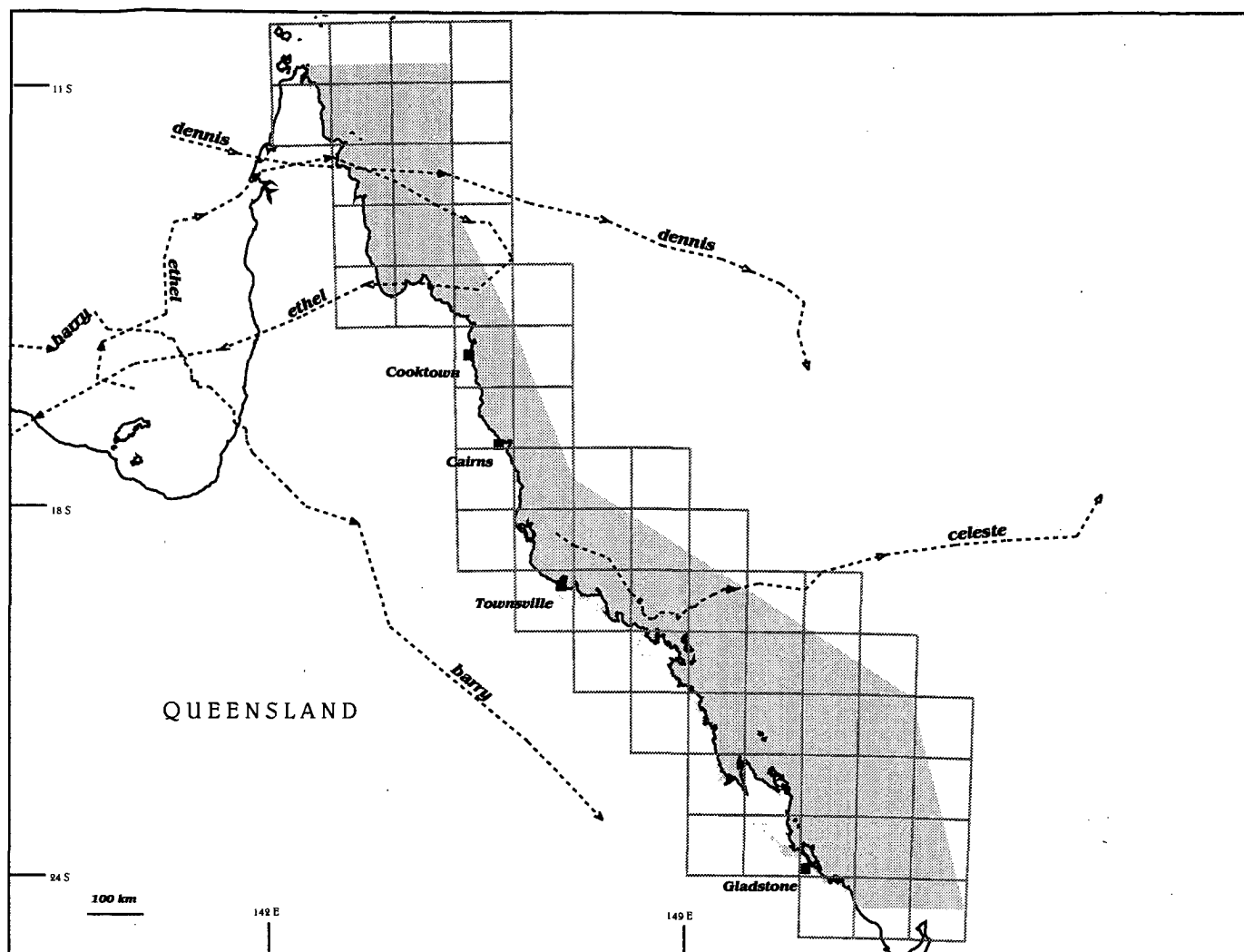
Map 92: *1994: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.*



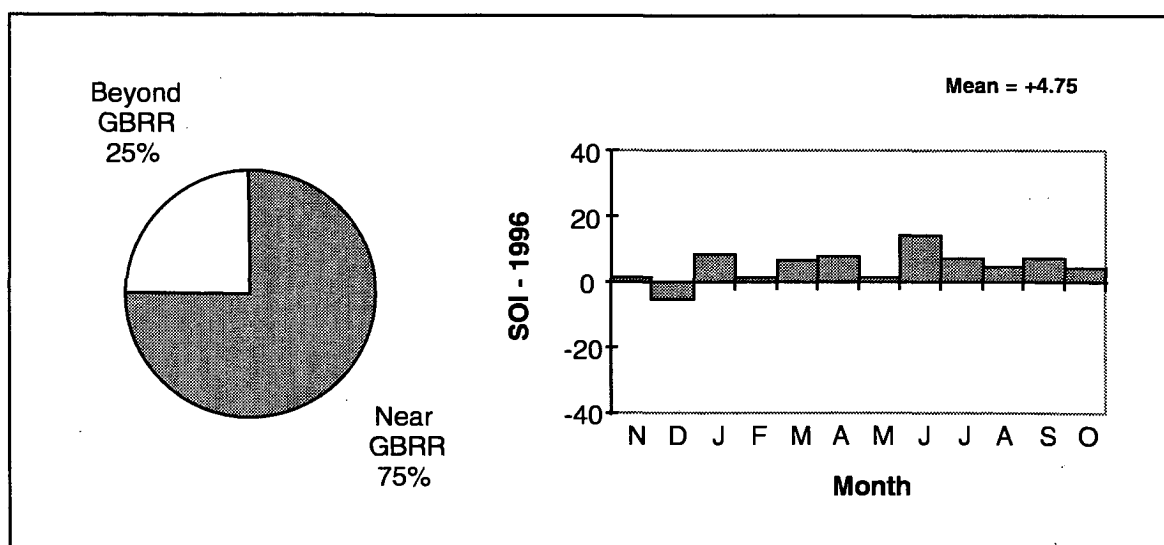
1994-1995



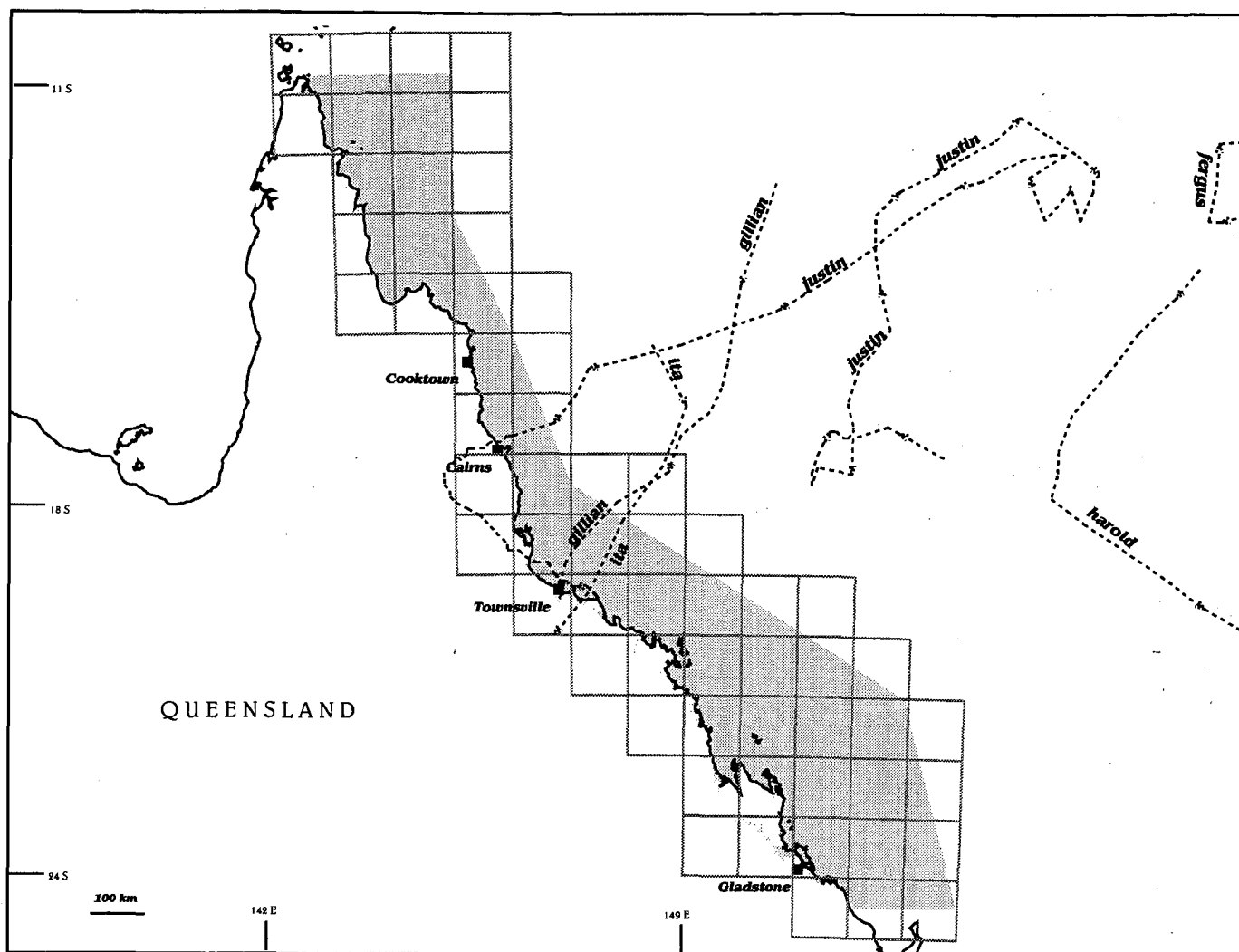
Map 93: *1995: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.*



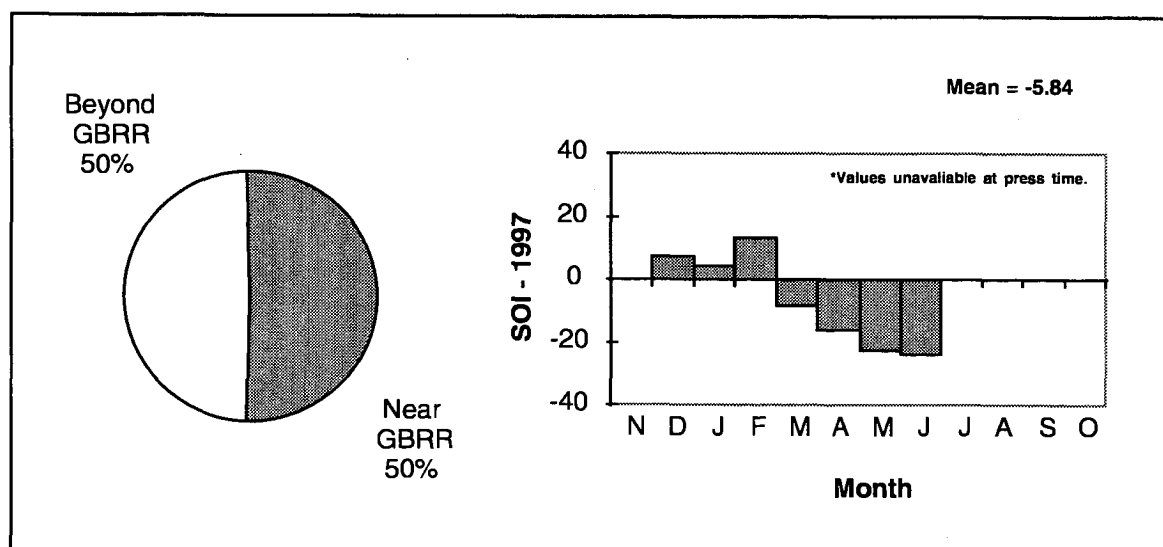
1995-1996



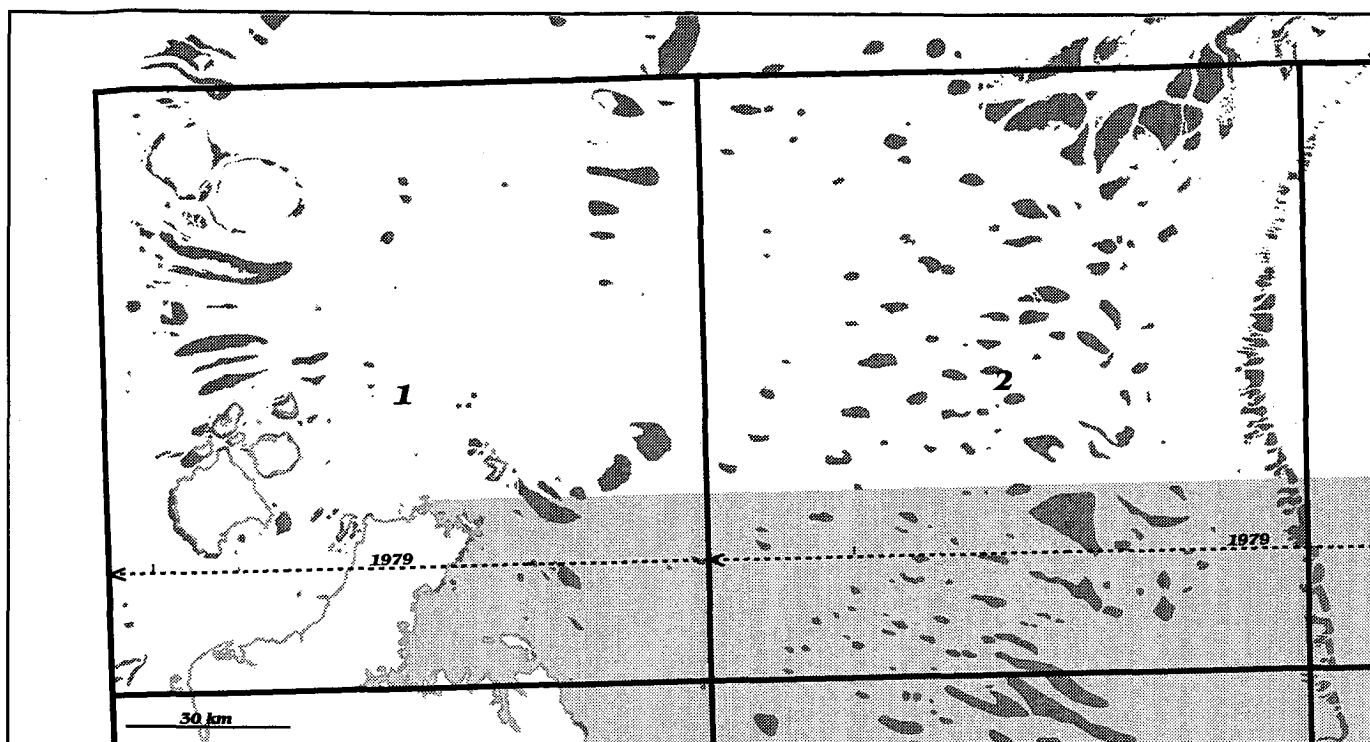
Map 94: 1996: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



1996-1997



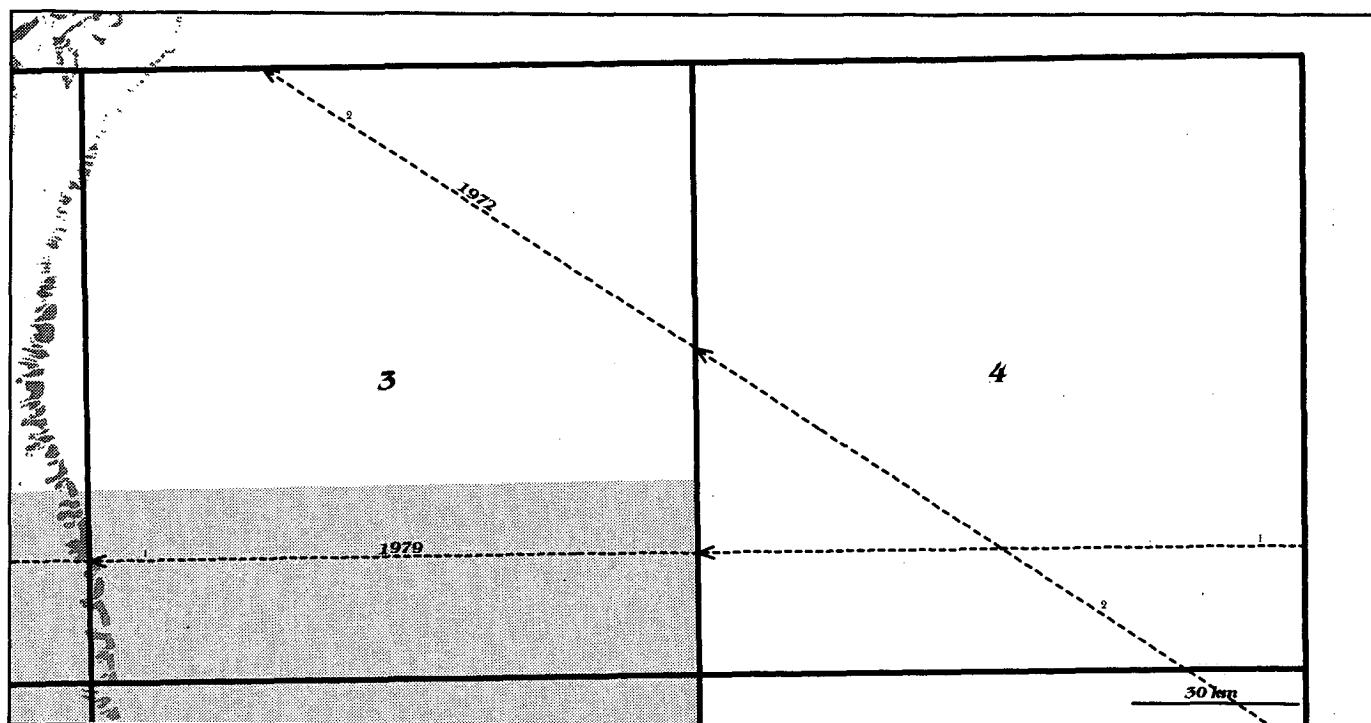
Map 95: 1997: All cyclone paths passing in the vicinity of the GBR Region. Dashed lines represent cyclone paths, with arrows indicating the direction of movement.



Map Boxes 1 and 2

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Stan	1979	8 April	0	1003 hPa

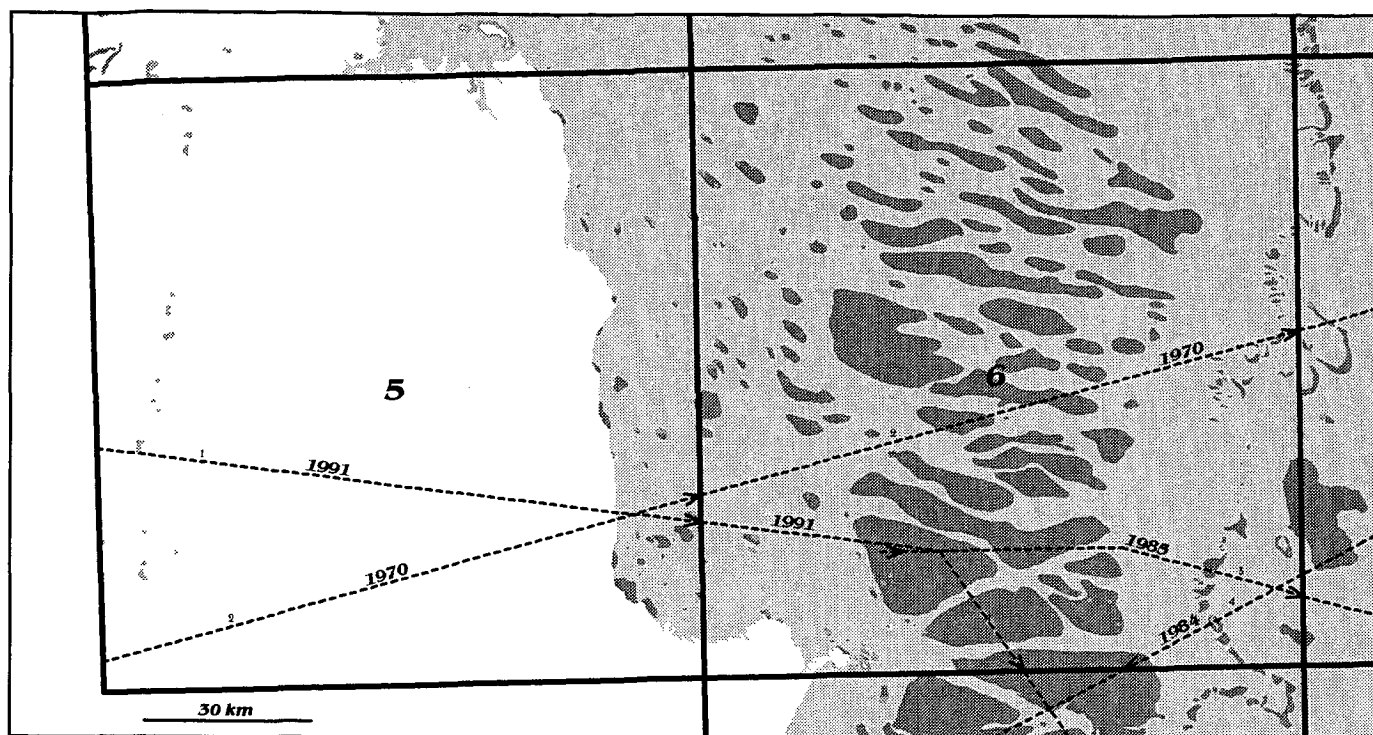
Map 96: All cyclone paths passing between 10-11°S and 142-144°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 3 and 4

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Stan	1979	7 April	0	1002 hPa
2	Faith	1972	21-22 April	0	998

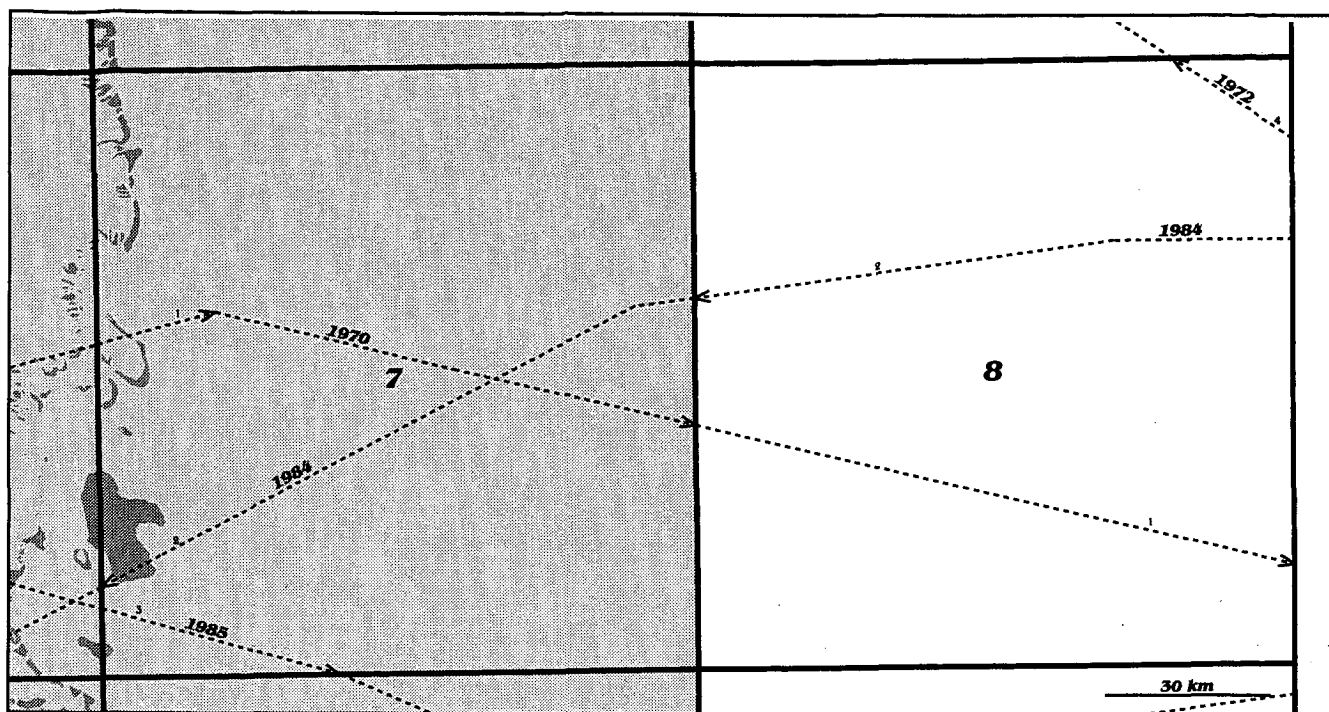
Map 97: All cyclone paths passing between 10-11°S and 144-146° E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 5 and 6

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Kelvin	1991	24 February	0	999 hPa
2	Dawn	1970	11 February	1	994
3	Pierre	1985	18 February	0	1002
4	Jim	1984	8 March	1	990

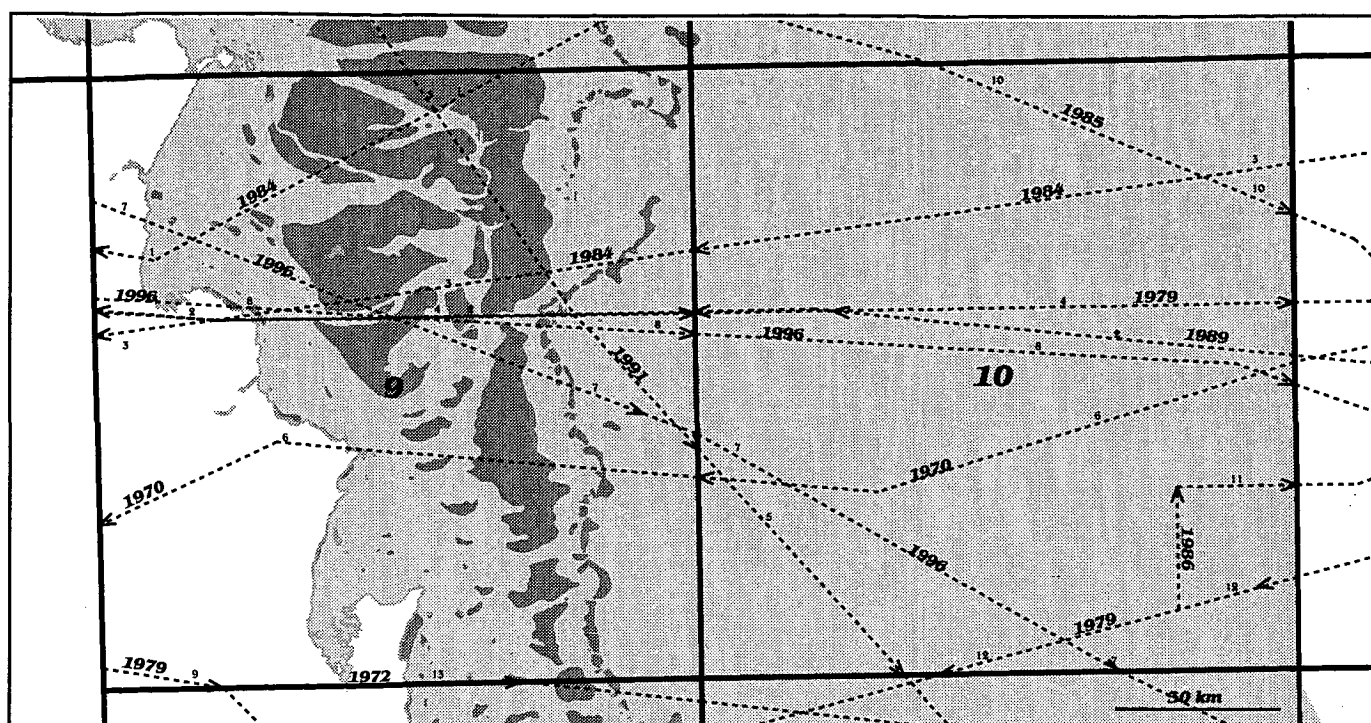
Map 98: All cyclone paths passing between 11-12°S and 142-144°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 7 and 8

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Dawn	1970	11 February	1	990 hPa
2	Jim	1984	7-8 March	2	980
3	Pierre	1985	18 February	0	1002
4	Faith	1972	21 April	0	998

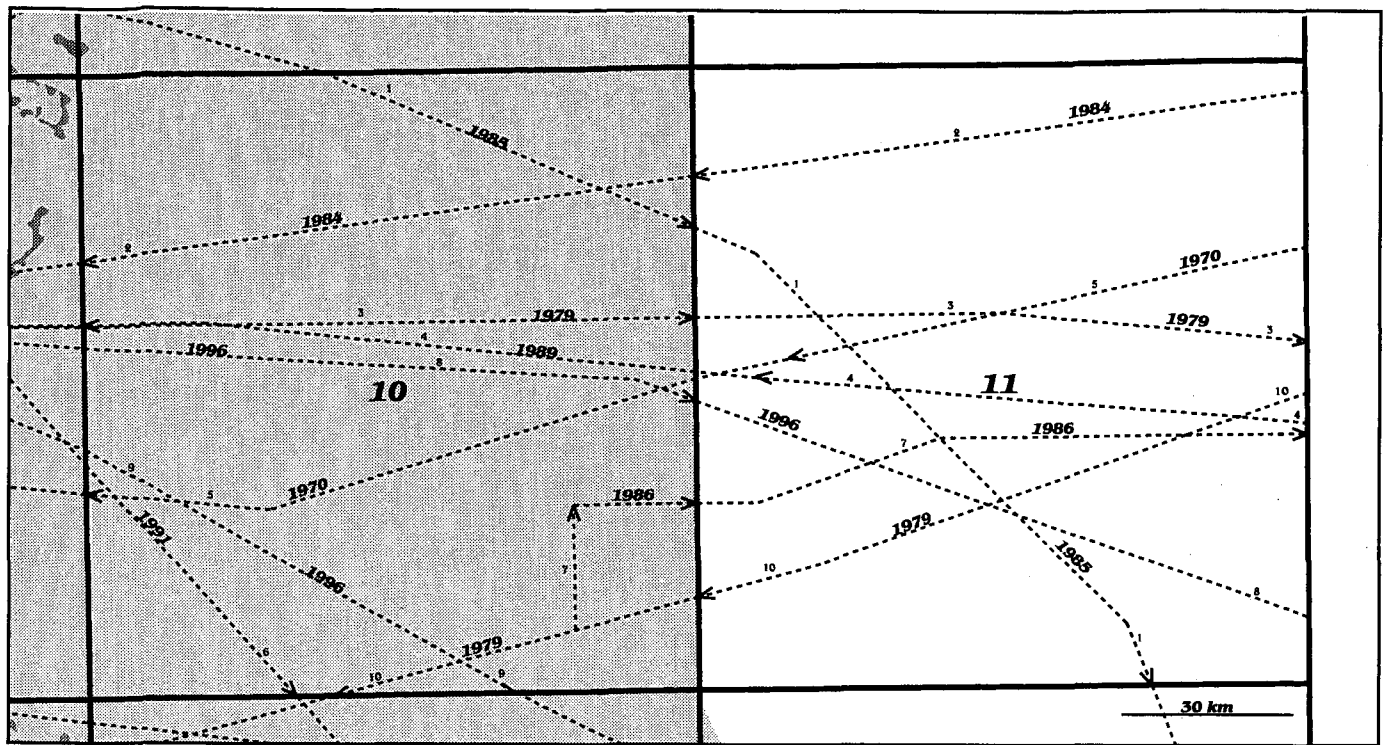
Map 99: All cyclone paths passing between 11-12° S and 144-146° E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 9 and 10

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Jim	1984	8 March	1	995 hPa
2	Meena	1989	8-9 May	1	995
3	Kathy	1984	19 March	1	990
4	Stan	1979	14 April	0	1002
5	Kelvin	1991	24 February	0	999
6	Cindy	1970	14-15 March	0	1004
7	Ethel	1996	10 March	1	990
8	Dennis	1996	15-16 February	1	995
9	Greta	1979	10 January	1	990
10	Pierre	1985	18-19 February	0	1002
11	Winifred	1986	27 January	0	999
12	Rosa	1979	16 February	0	1006
13	Faith	1972	14 April	0	1002

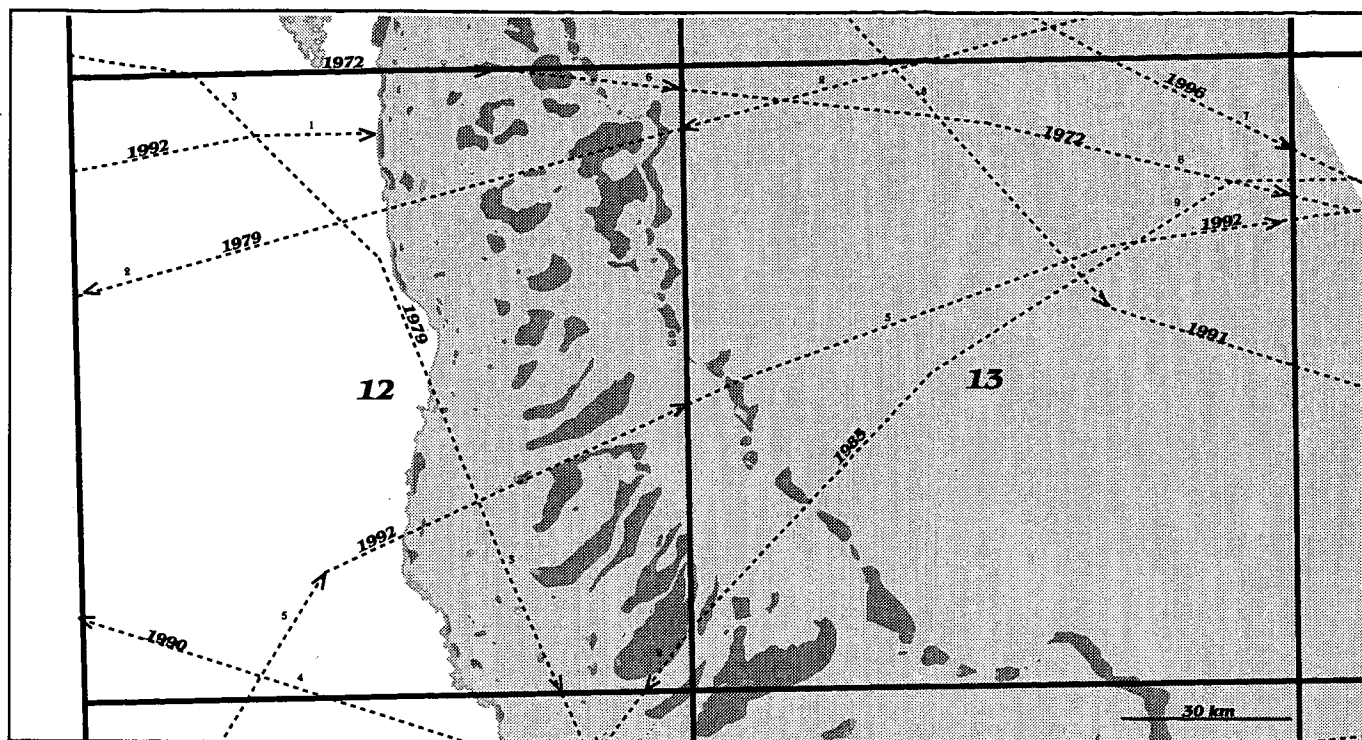
Map 100: All cyclone paths passing between 12-13°S and 143-145°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 10 and 11

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Pierre	1985	18-19 February	0	1001 hPa
2	Kathy	1984	18-19 March	1	990
3	Stan	1979	14 April	0	1000
4	Meena	1989	8 May	1	995
5	Cindy	1970	14 March	0	1003
6	Kelvin	1991	24 February	0	1000
7	Winifred	1986	27-28 January	0	1003
8	Dennis	1996	16 February	1	995
9	Ethel	1996	19 March	1	990
10	Rosa	1979	15-16 February	0	1006

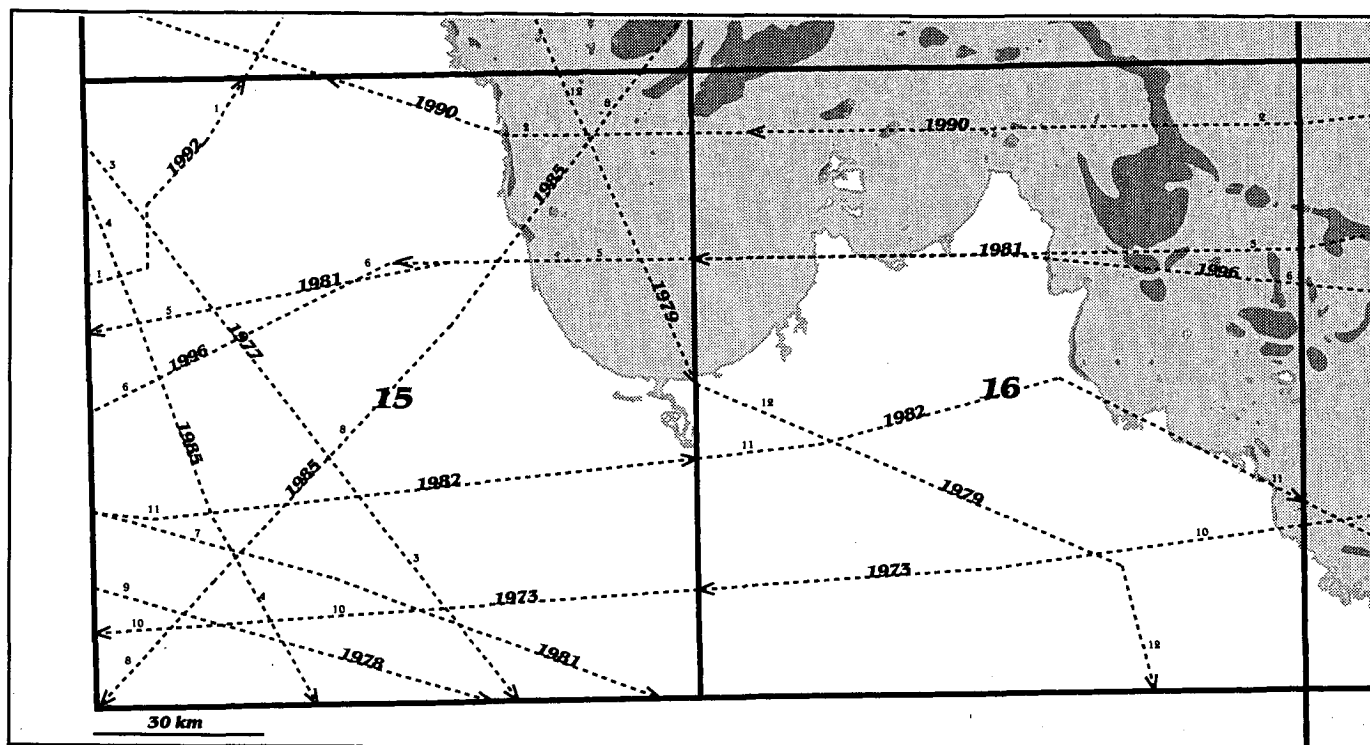
Map 101: All cyclone paths passing between 12-13°S and 144-146°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 12 and 13

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Mark	1992	10 January	1	995 hPa
2	Rosa	1979	16 February	0	1006
3	Greta	1979	10-11 January	1	990
4	Ivor	1990	19 March	2	983
5	Nina	1992	27 December	1	990
6	Faith	1972	14 April	0	997
7	Ethel	1996	10 March	1	990
8	Kelvin	1991	24 February	0	1000
9	Tanya	1985	31 March - 1 April	1	986

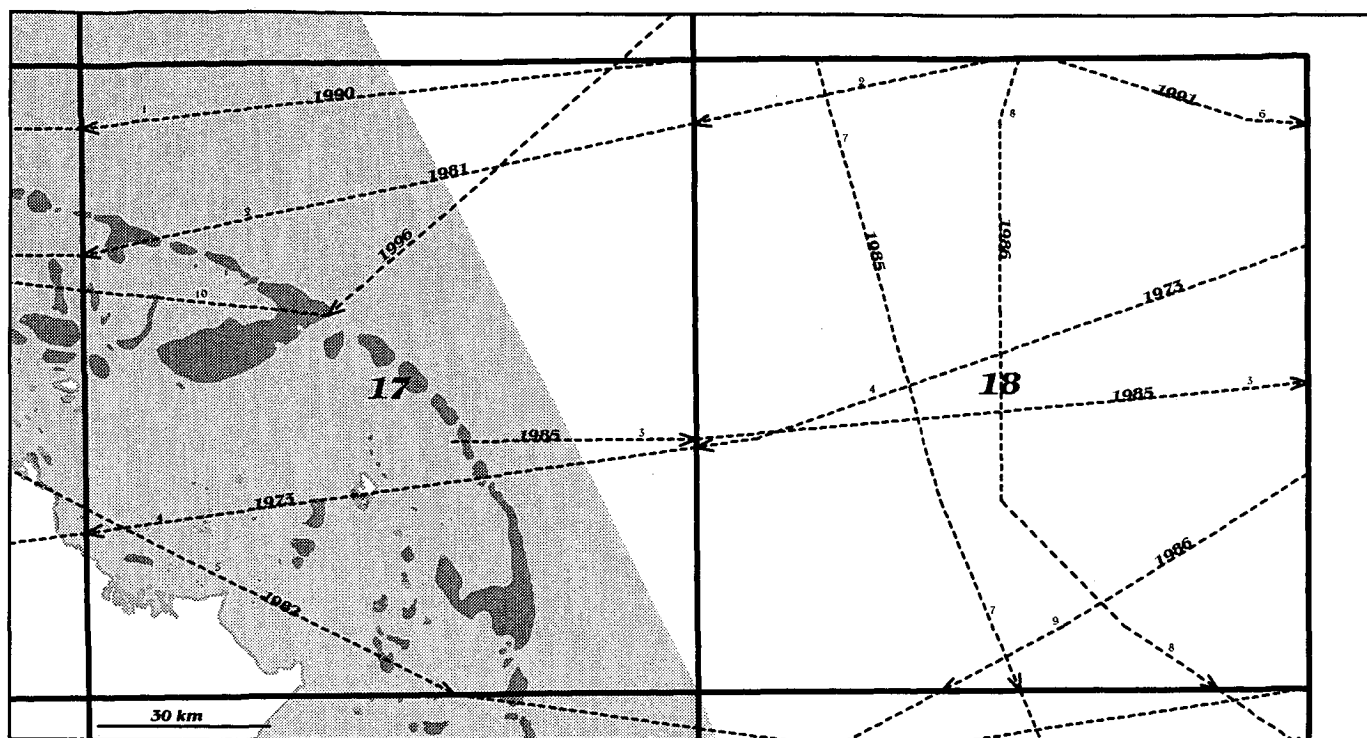
Map 102: *All cyclone paths passing between 13-14°S and 143-145°E from 1969-1997. The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.*



Map Boxes 15 and 16

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Nina	1992	26-27 December	1	990 hPa
2	Ivor	1990	19 March	3	970
3	Otto	1977	8 March	1	998
4	Rebecca	1985	23 February	0	1001
5	Eddie	1981	10 February	2	985
6	Ethel	1996	12 March	2	985
7	Freda	1981	25 February	1	994
8	Tanya	1985	1 April	0	999
9	Hal	1978	7 April	0	998
10	Madge	1973	4 March	0	997
11	Dominic	1982	8 April	0	995
12	Greta	1979	11 January	1	990

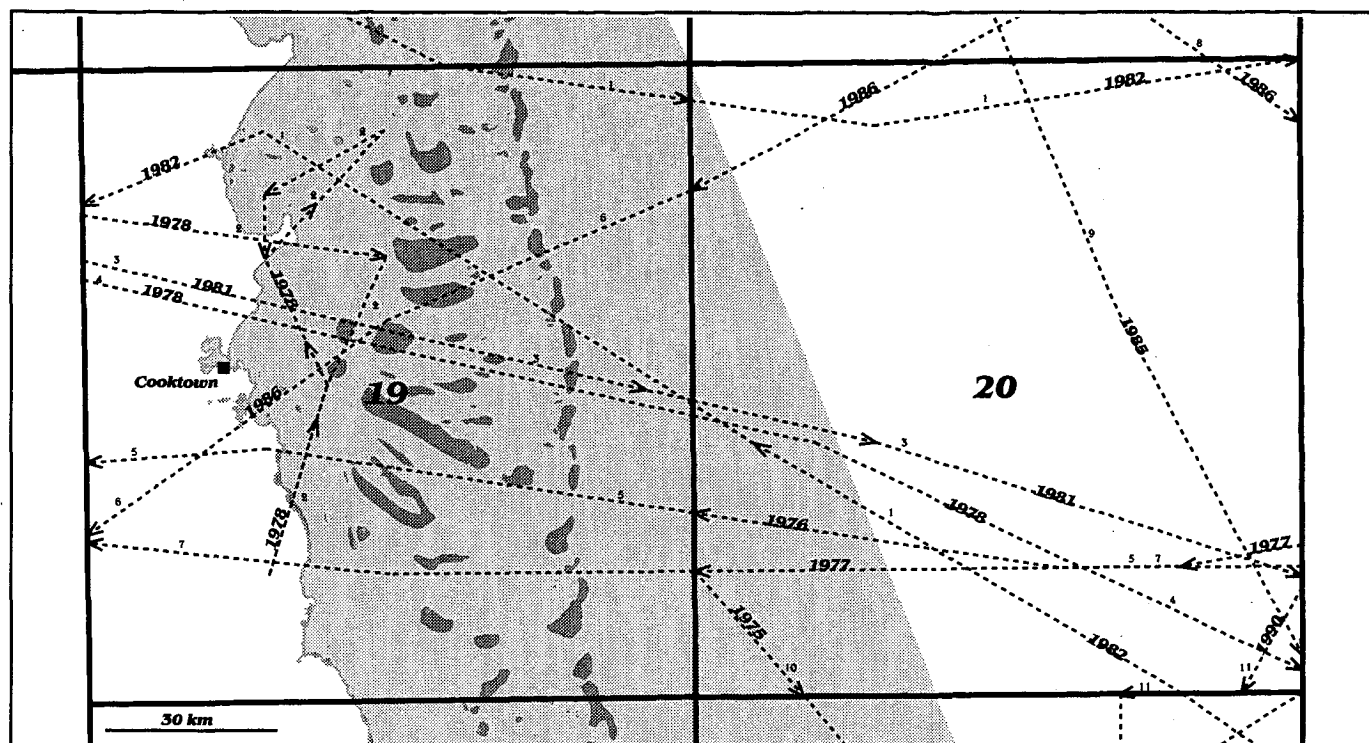
Map 104: *All cyclone paths passing between 14-15°S and 143-145°E from 1969-1997. The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.*



Map Boxes 17 and 18

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Ivor	1990	19 March	3	965 hPa
2	Eddie	1981	10 February	1	987
3	Odette	1985	16 January	0	1002
4	Madge	1973	4 March	0	998
5	Dominic	1982	8 April	0	1002
6	Kelvin	1991	24 February	0	1000
7	Pierre	1985	20 February	0	998
8	Winifred	1986	29-30 January	1	987
9	Manu	1986	25 April	1	994
10	Ethel	1996	11 March	1	988

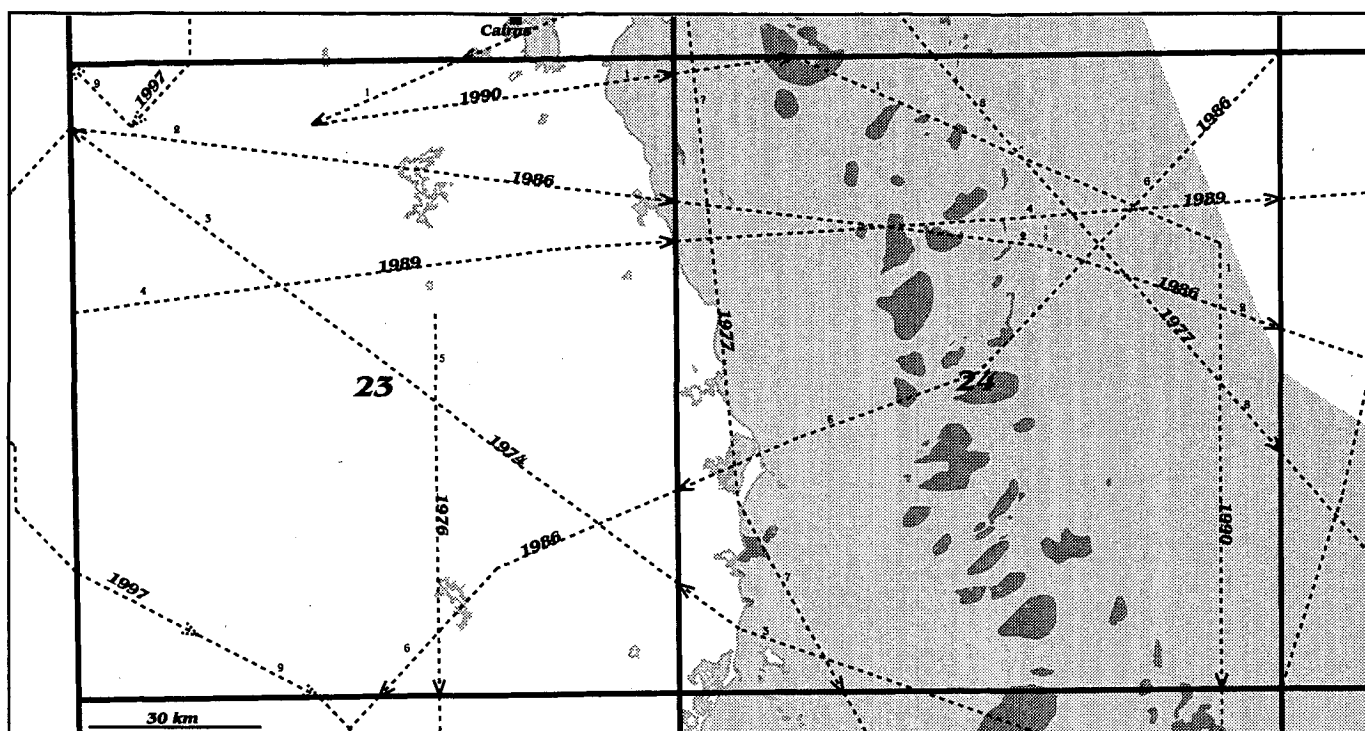
Map 105: All cyclone paths passing between 14-15° S and 145-147° E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 19 and 20

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Dominic	1982	8-14 April	0	1000 hPa
2	Peter	1978	1-3 January	1	993
3	Freda	1981	26 February	1	992
4	Hal	1978	8 April	0	998
5	Alan	1976	1 February	1	995
6	Manu	1986	26 April	0	996
7	Nancy	1977	12-13 February	0	998
8	Winifred	1986	30 January	2	983
9	Pierre	1985	20 February	1	995
10	Gloria	1975	15 January	1	993
11	Joy	1990	22 December	3	945

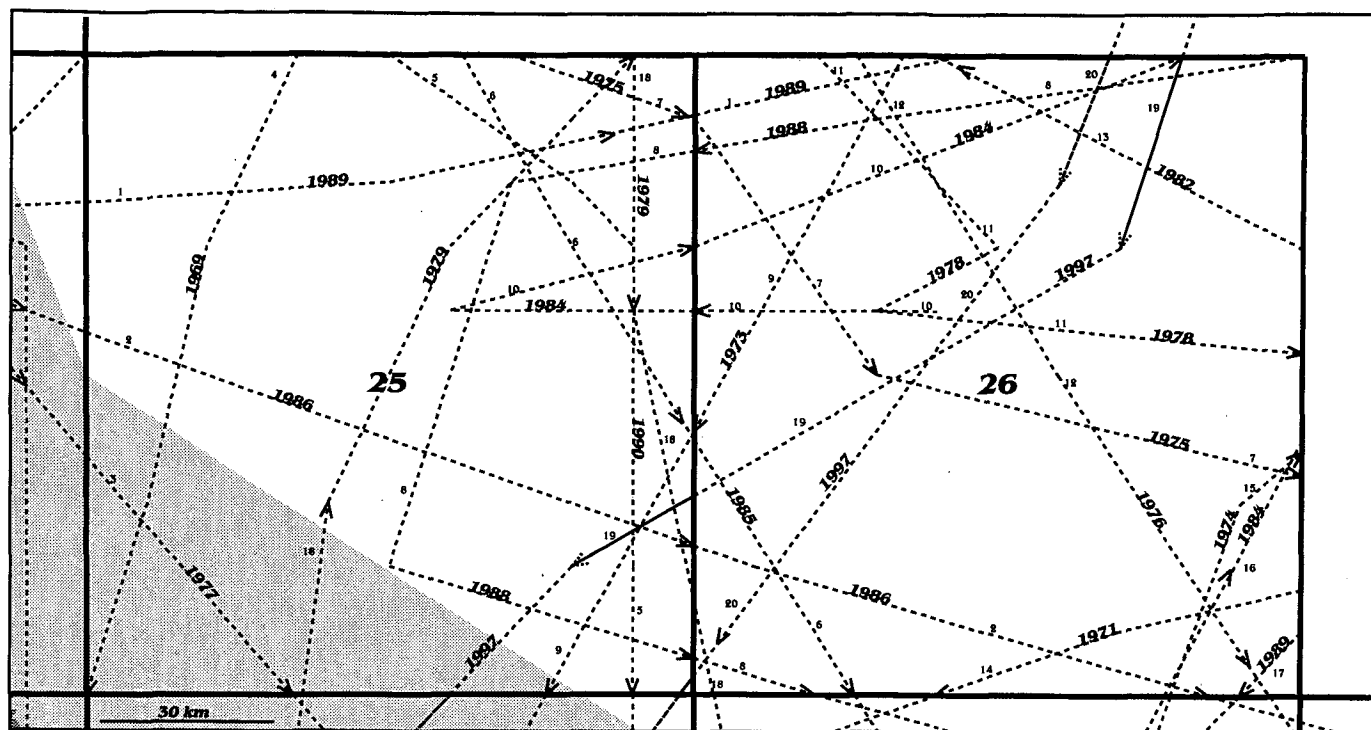
Map 106: *All cyclone paths passing between 15-16°S and 145-147°E from 1969-1997. The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.*



Map Boxes 23 and 24

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Ivor	1990	23 March	0	999 hPa
2	Vernon	1986	23 January	1	995
3	Yvonne	1974	10 February	1	995
4	Felicity	1989	16 December	0	999
5	Dawn	1976	4 March	0	997
6	Winifred	1986	1 February	3	957
7	Keith	1977	31 January	1	994
8	Otto	1977	8-9 March	1	987
9	Justin	1997	22-23 March	0	997

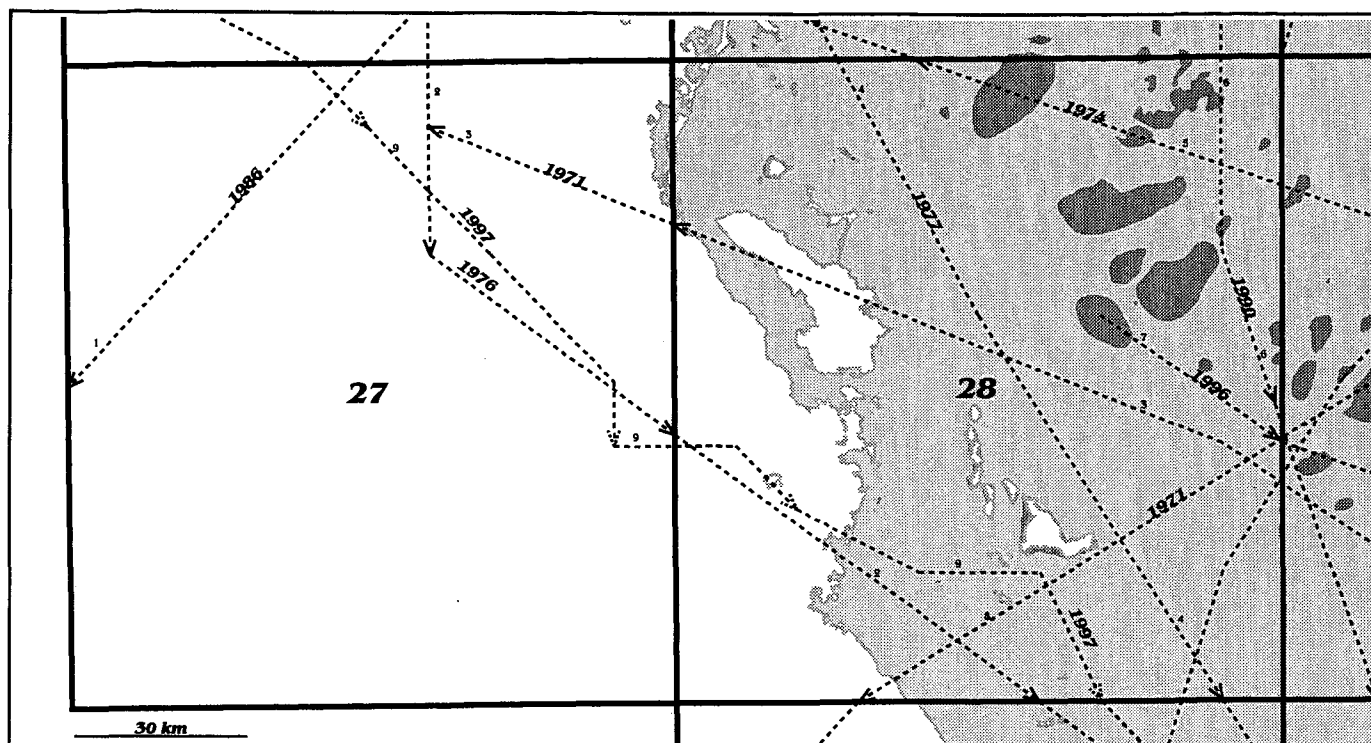
Map 108: *All cyclone paths passing between 17-18°S and 145-147°E from 1969-1997. The dashed lines show cyclone paths. The main land and islands are shaded white, the GBR Region light gray and reefs dark gray.*



Map Boxes 25 and 26

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Felicity	1989	16 December	0	999 hPa
2	Vernon	1986	23 January	1	995
3	Otto	1977	8-9 March	1	987
4	Bridget	1969	26-27 January	0	1004
5	Joy	1990	25 December	2	980
6	Pierre	1985	20 February	1	991
7	Gloria	1975	16 January	2	984
8	Delilah	1988	30 December	0	999
9	Una	1973	18 December	1	992
10	Ingrid	1984	20 February	0	1001
11	Hal	1978	8-9 April	0	998
12	Watorea	1976	27 April	2	978
13	Dominic	1982	13 April	0	1004
14	Althea	1971	23 December	3	952
15	Vera	1974	19 January	0	996
16	Grace	1984	11 January	0	1004
17	Aivu	1989	3 April	4	942
18	Kerry	1979	2-3 March	1	998
19	Gillian	1997	11 February	1	998
20	Ita	1997	25 February	1	996

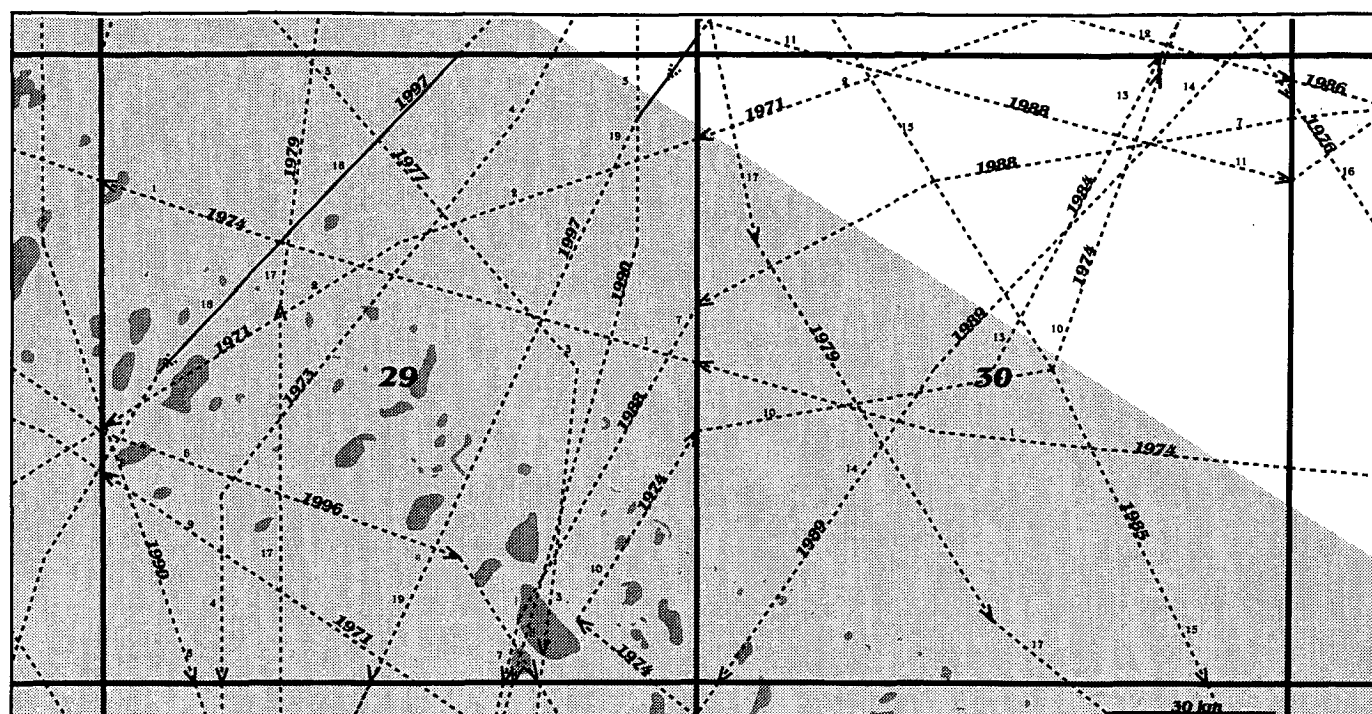
Map 109: *All cyclone paths passing between 17-18°S and 147-149°E from 1969-1997. The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.*



Map Boxes 27 and 28

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Winifred	1986	1 February	2	982 hPa
2	Dawn	1976	4 March	1	995
3	Gertie	1971	15-16 February	1	988
4	Keith	1977	31 January	1	994
5	Yvonne	1974	9-10 February	1	995
6	Ivor	1990	24 March	0	1000
7	Celeste	1996	26 January	1	995
8	Althea	1971	24 December	3	952
9	Justin	1997	23 March	0	999

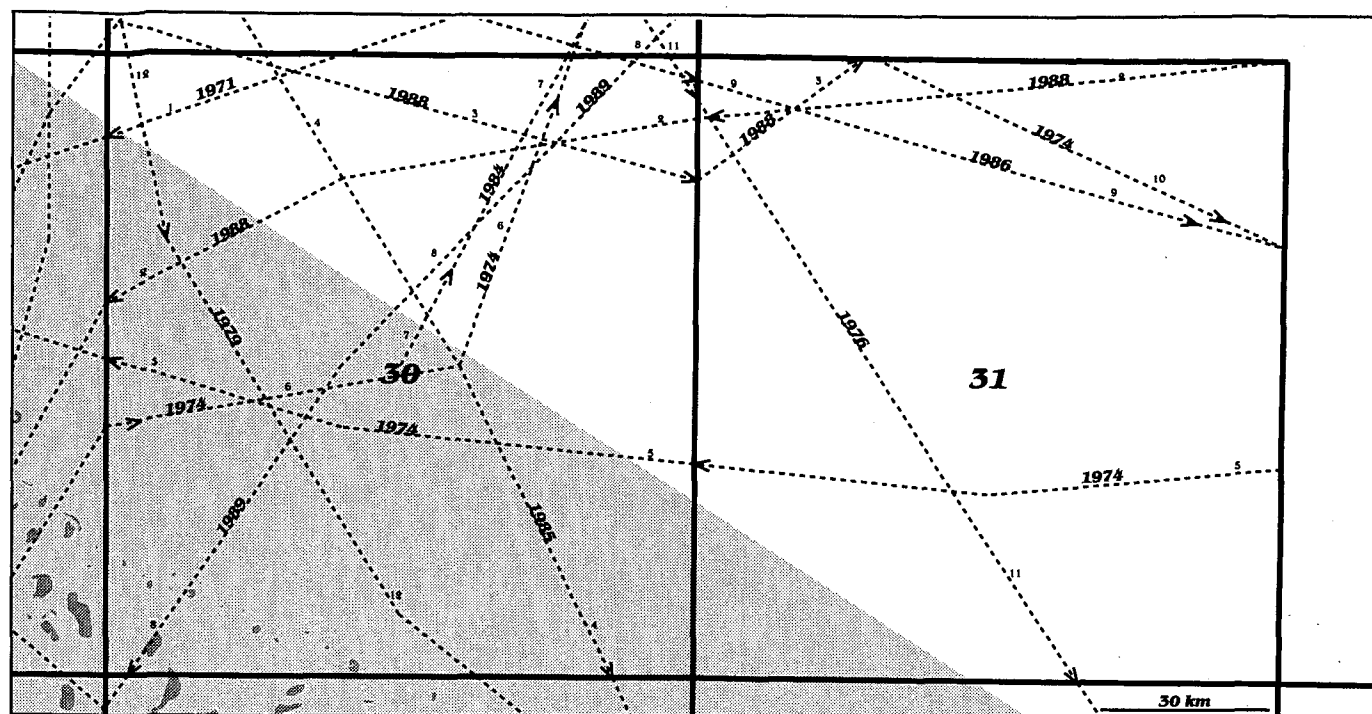
Map 110: All cyclone paths passing between 18-19°S and 144-146°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 29 and 30

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Yvonne	1974	9 February	0	999 hPa
2	Althea	1971	23 December	3	952
3	Otto	1977	9 March	1	987
4	Una	1973	18 December	1	989
5	Joy	1990	26 December	2	980
6	Celeste	1996	26 January	1	995
7	Charlie	1988	28 February	2	985
8	Ivor	1990	24 March	0	1000
9	Gertie	1971	15 February	1	988
10	Vera	1974	18-19 January	0	996
11	Delilah	1988	30 December	0	998
12	Vernon	1986	23 January	1	995
13	Grace	1984	11 January	0	1007
14	Aivu	1989	3 April	3	948
15	Pierre	1985	21 February	1	986
16	Watorea	1976	27 April	2	978
17	Kerry	1979	2-4 March	1	995
18	Gillian	1997	12 February	0	1002
19	Ita	1997	24 February	1	995

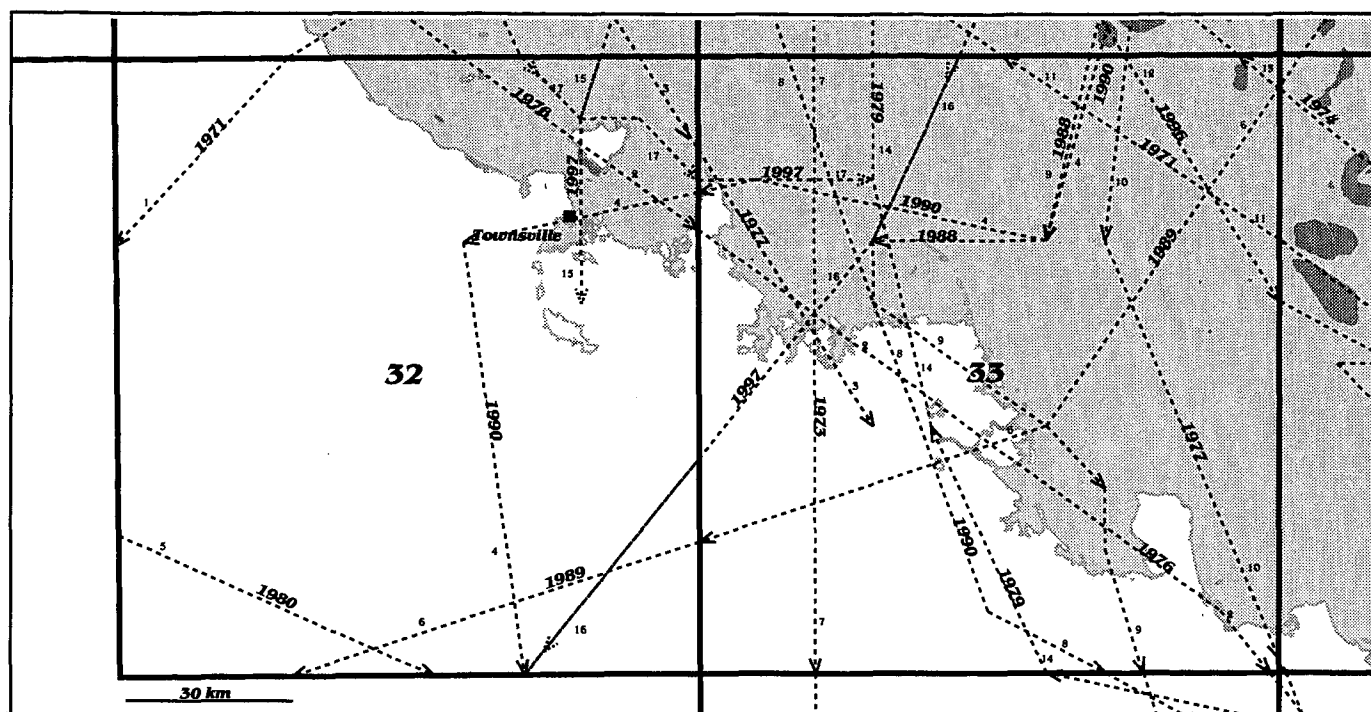
Map 111: All cyclone paths passing between 18-19°S and 147-149°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 30 and 31

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Althea	1971	23 December	3	952 hPa
2	Charlie	1988	28 February	2	985
3	Delilah	1988	30 December	0	998
4	Pierre	1985	21 February	1	986
5	Yvonne	1974	9 February	0	1002
6	Vera	1974	18-19 January	0	988
7	Grace	1984	11 January	0	1007
8	Aivu	1989	3 April	3	948
9	Vernon	1986	23 January	1	991
10	Wanda	1974	21 January	0	1003
11	Watorea	1976	27 April	2	978
12	Kerry	1979	4 March	1	995

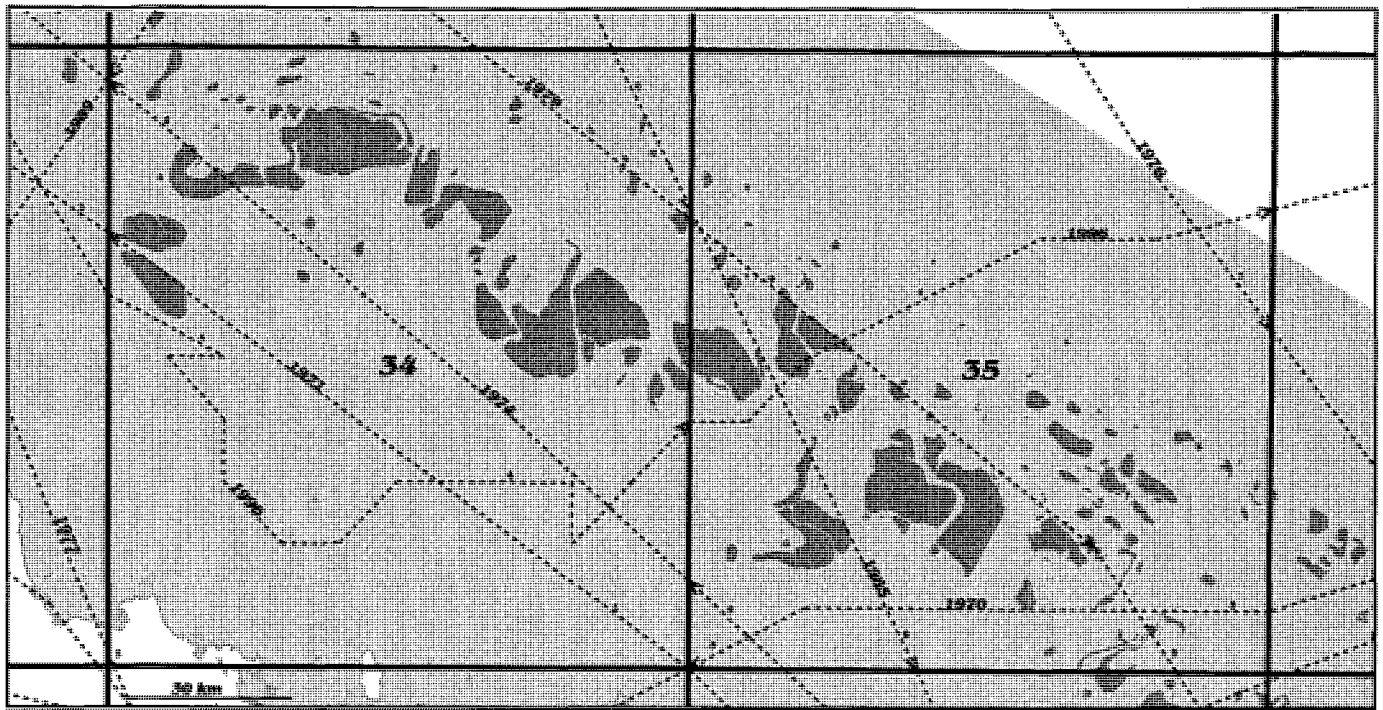
Map 112: All cyclone paths passing between 18-19° S and 148-150° E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 32 and 33

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Althea	1971	24 December	3	952 hPa
2	Dawn	1976	4 March	1	995
3	Keith	1977	31 January - 1 Feb.	1	994
4	Joy	1990	26-27 December	2	983
5	Paul	1980	6 January	0	995
6	Aivu	1989	4 April	3	955
7	Una	1973	18 December	1	988
8	Ivor	1990	24 March	0	1000
9	Charlie	1988	29 February	3	972
10	Otto	1977	9 March	1	987
11	Gertie	1971	15 February	1	988
12	Celeste	1996	26 January	0	995
13	Vera	1974	18-19 January	0	996
14	Kerry	1979	1-2 March	0	998
15	Gillian	1997	12 February	0	1005
16	Ita	1997	24 February	1	994
17	Justin	1997	23 March	0	999

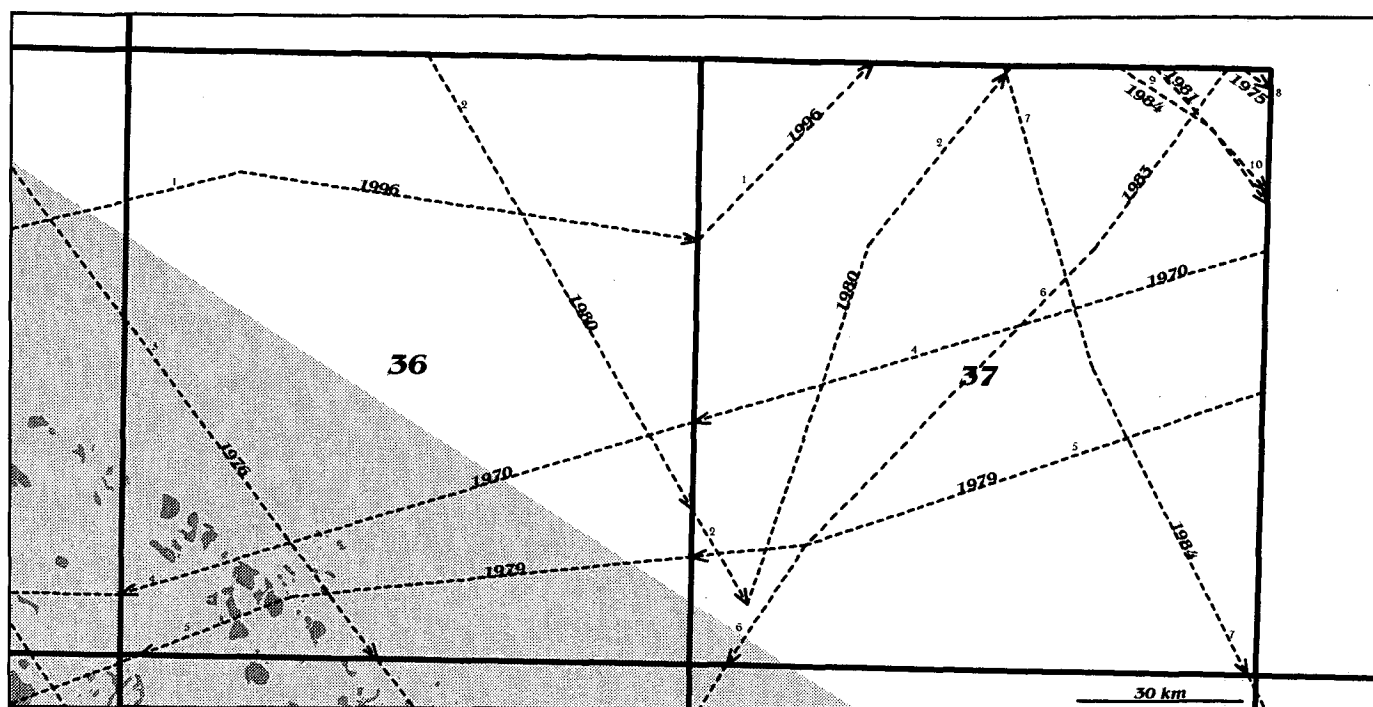
Map 113: All cyclone paths passing between 19-20°S and 146-148°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 34 and 35

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Aivu	1989	3-4 April	3	948 hPa
2	Vera	1974	18 January	0	997
3	Gertie	1971	15 February	2	983
4	Celeste	1996	26-27 January	3	965
5	Otto	1977	9 March	1	989
6	Pierre	1985	21 February	1	986
7	Watorea	1976	28 April	2	980
8	Ada	1970	17 January	3	963
9	Kerry	1979	4 March	1	995

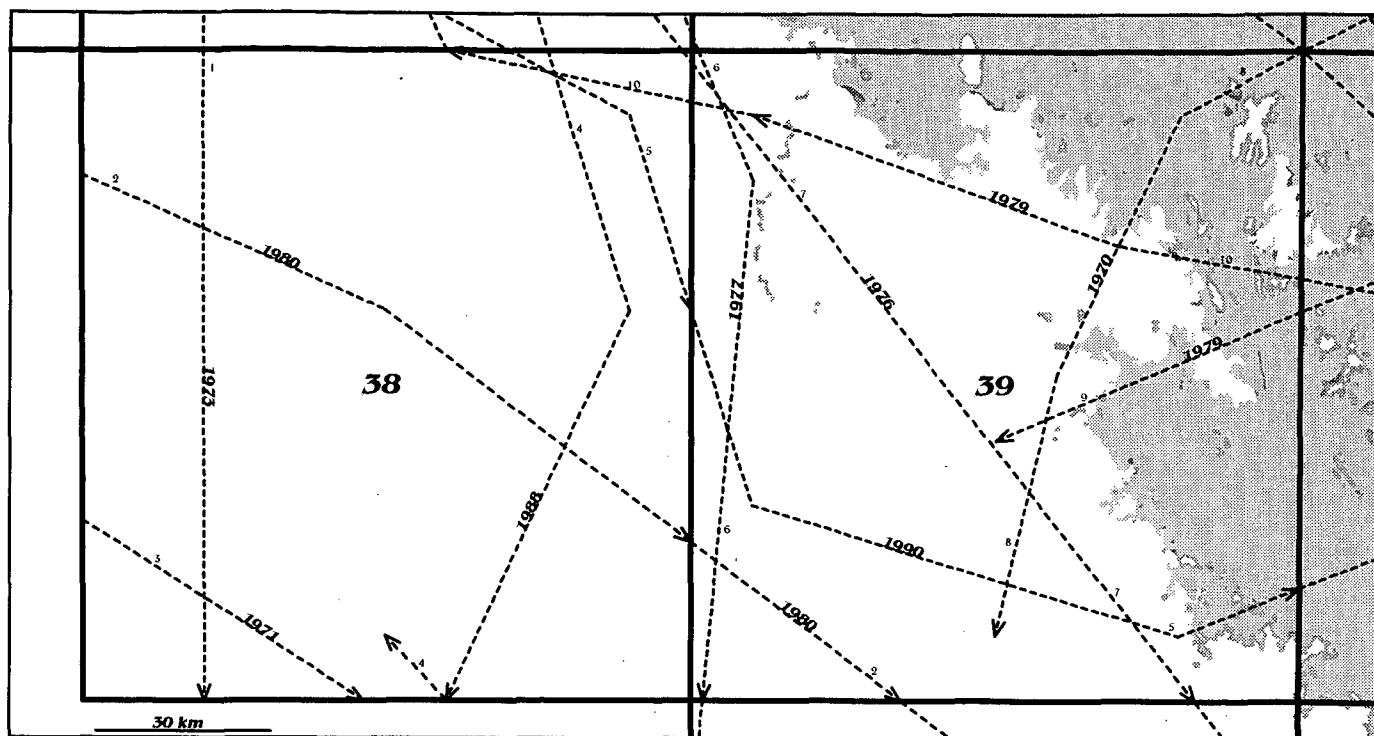
Map 114: *All cyclone paths passing between 19-20° S and 148-150° E from 1969-1997. The dashed lines show cyclone paths. The main land and islands are shaded white, the GBR Region light gray and reefs dark gray.*



Map Boxes 36 and 37

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Celeste	1996	27-28 January	3	970 hPa
2	Ruth	1980	11 February	0	1003
3	Watorea	1976	28 April	2	980
4	Ada	1970	17 January	3	966
5	Gordon	1979	11 January	0	1001
6	Elinor	1983	3 January	2	980
7	Lance	1984	6 April	1	995
8	Gloria	1975	17 January	2	982
9	Grace	1984	15 January	2	975
10	Freda	1981	27 February	2	978

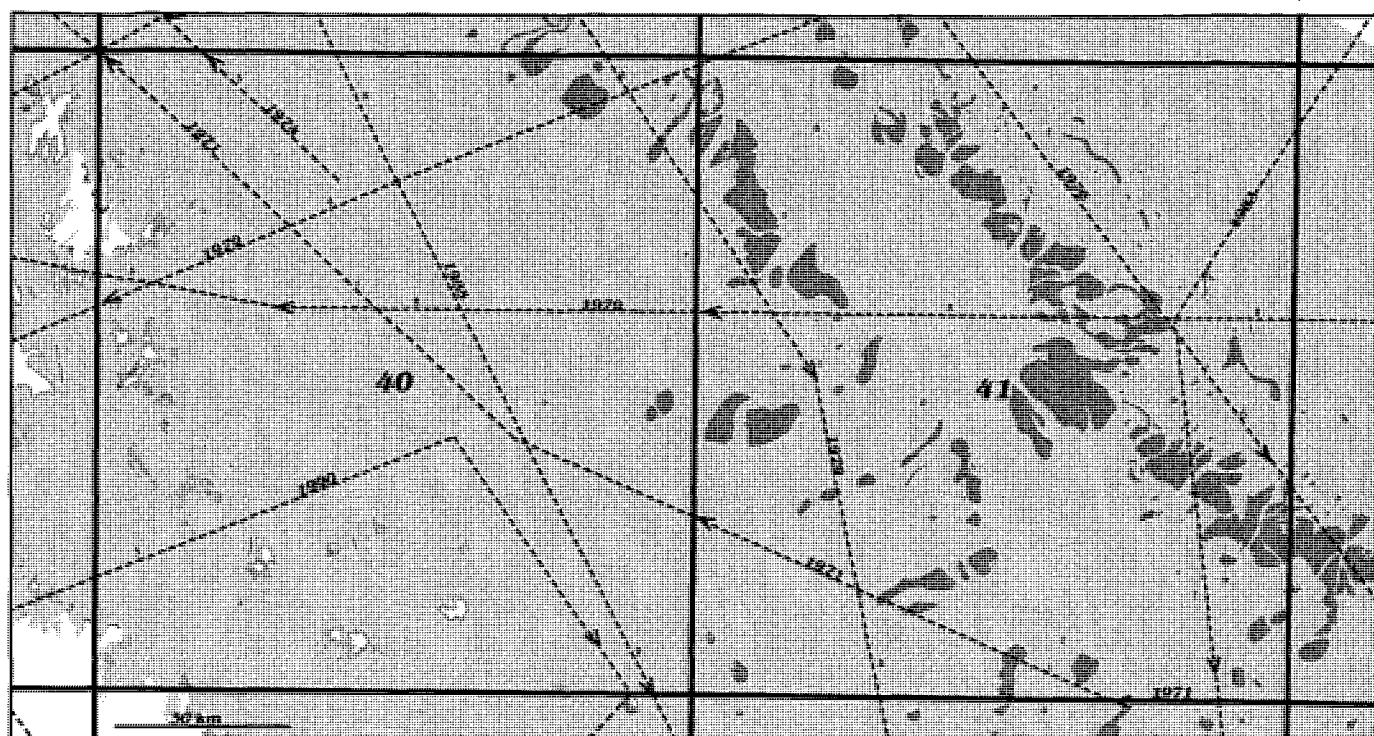
Map 115: All cyclone paths passing between 19-20°S and 150-152°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 38 and 39

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Una	1973	19 December	0	998 hPa
2	Paul	1980	6 January	1	995
3	Fiona	1971	20 February	1	994
4	Charlie	1988	1 March	0	993
5	Ivor	1990	24-25 March	0	1002
6	Otto	1977	9 March	1	989
7	Dawn	1976	5 March	1	995
8	Ada	1970	17-18 January	3	962
9	Gordon	1979	12 January	0	1001
10	Kerry	1979	1 March	1	992

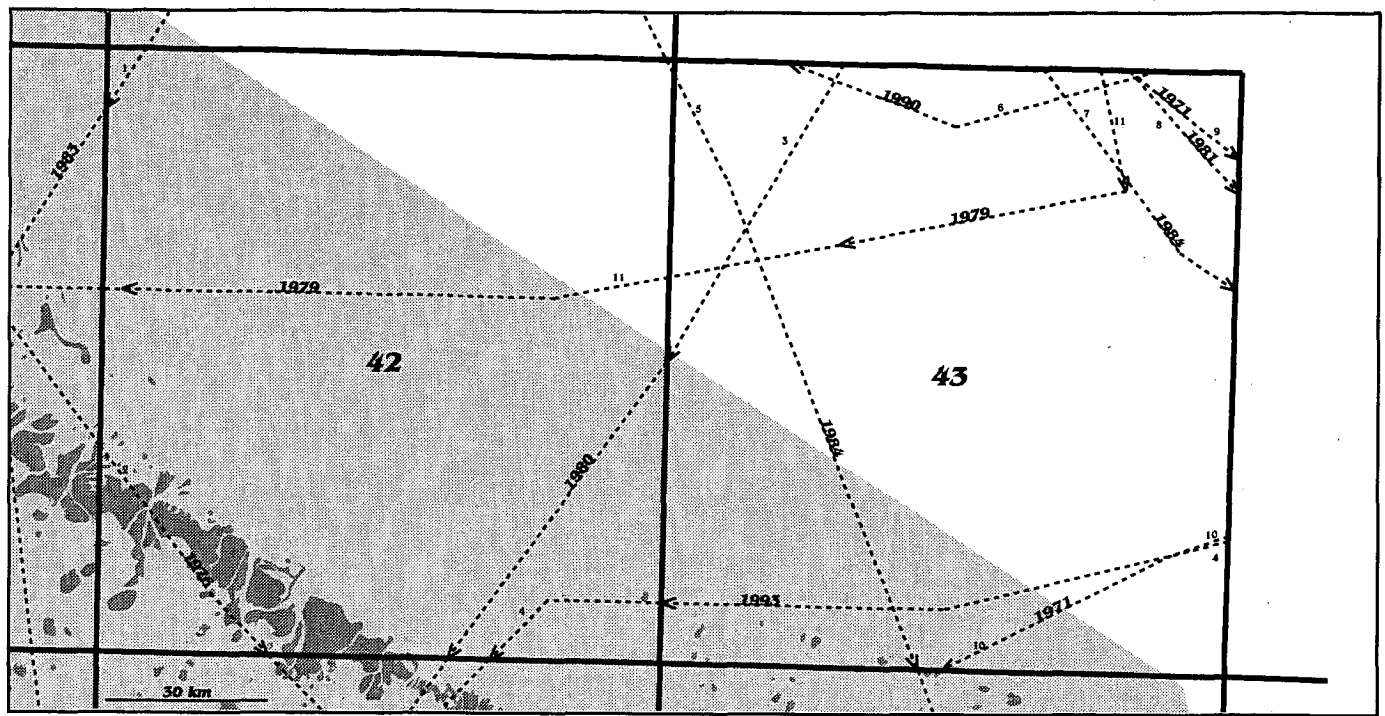
Map 116: All cyclone paths passing between 20-21°S and 147-149°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 40 and 41

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Gertie	1971	14-15 February	2	983 hPa
2	Pierre	1985	21 February	1	986
3	Vera	1974	18 January	0	1000
4	Gordon	1979	11 January	0	1001
5	Ivor	1990	25 March	0	1006
6	Watorea	1976	28 April	2	980
7	Elinor	1983	2 March	2	981
8	Kerry	1979	28 February 4 March	1	993

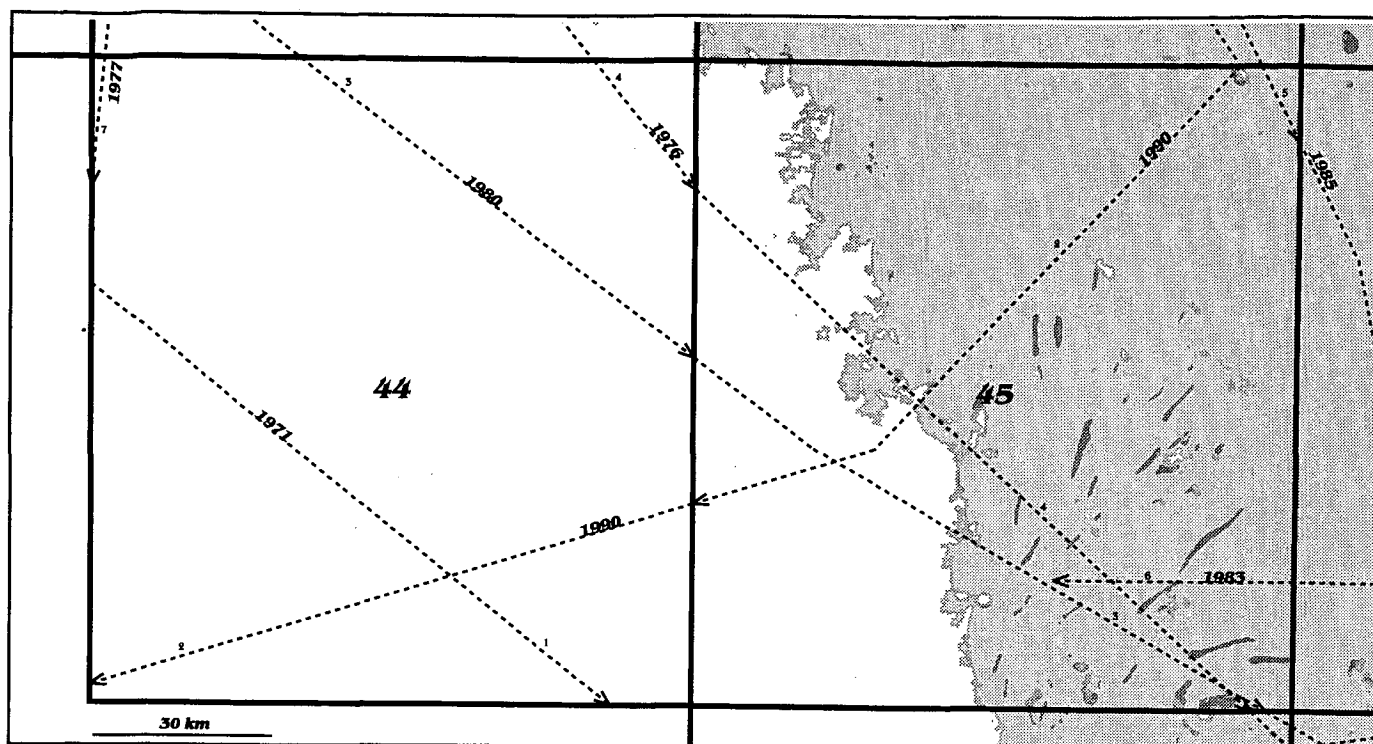
Map 117: All cyclone paths passing between 20-21°S and 149-151°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 42 and 43

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Elinor	1983	2 March	2	981 hPa
2	Watorea	1976	28 April	2	980
3	Simon	1980	23 February	2	980
4	Rewa	1993	18 January	3	965
5	Lance	1984	7 April	1	995
6	Hilda	1994	4 March	0	996
7	Grace	1984	16 January	2	975
8	Freda	1981	28 February	2	978
9	Dora	1971	10 February	0	998
10	Gertie	1971	14 February	2	983
11	Kerry	1979	27-28 February	1	994

Map 118: All cyclone paths passing between 20-21°S and 151-153°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 44 and 45

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Fiona	1971	21 February	1	995 hPa
2	Ivor	1990	25-26 March	0	1006
3	Paul	1980	7 January	1	995
4	Dawn	1976	5 March	1	995
5	Pierre	1985	21 February	1	990
6	Elinor	1983	3 March	0	999
7	Otto	1977	9 March	1	990

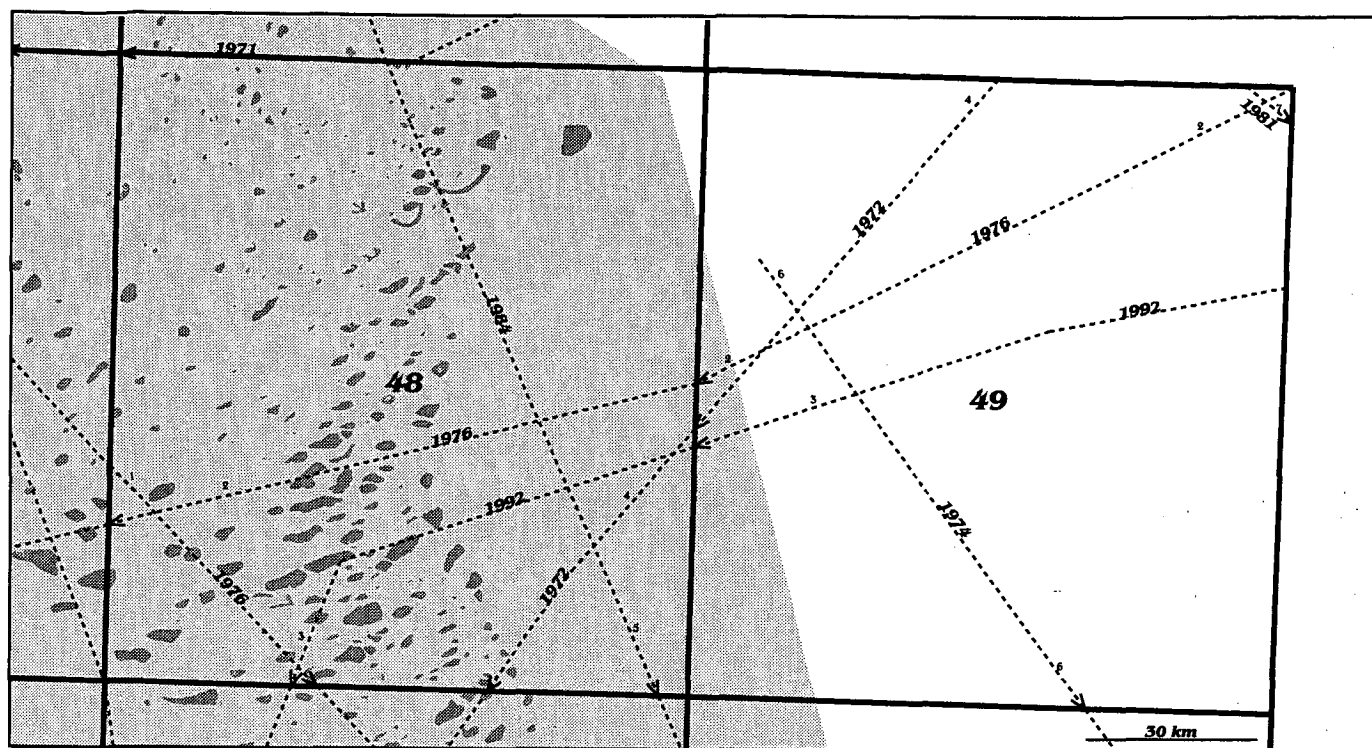
Map 119: All cyclone paths passing between 21-22° S and 148-150° E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 46 and 47

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Pierre	1985	21 February	1	990 hPa
2	Gertie	1971	14 February	2	983
3	Elinor	1983	2-3 March	2	980
4	David	1976	19 January	3	961
5	Simon	1980	23 February	3	970
6	Watorea	1976	28 April	2	980
7	Rewa	1993	19 January	2	975
8	Kerry	1979	5 March	1	995

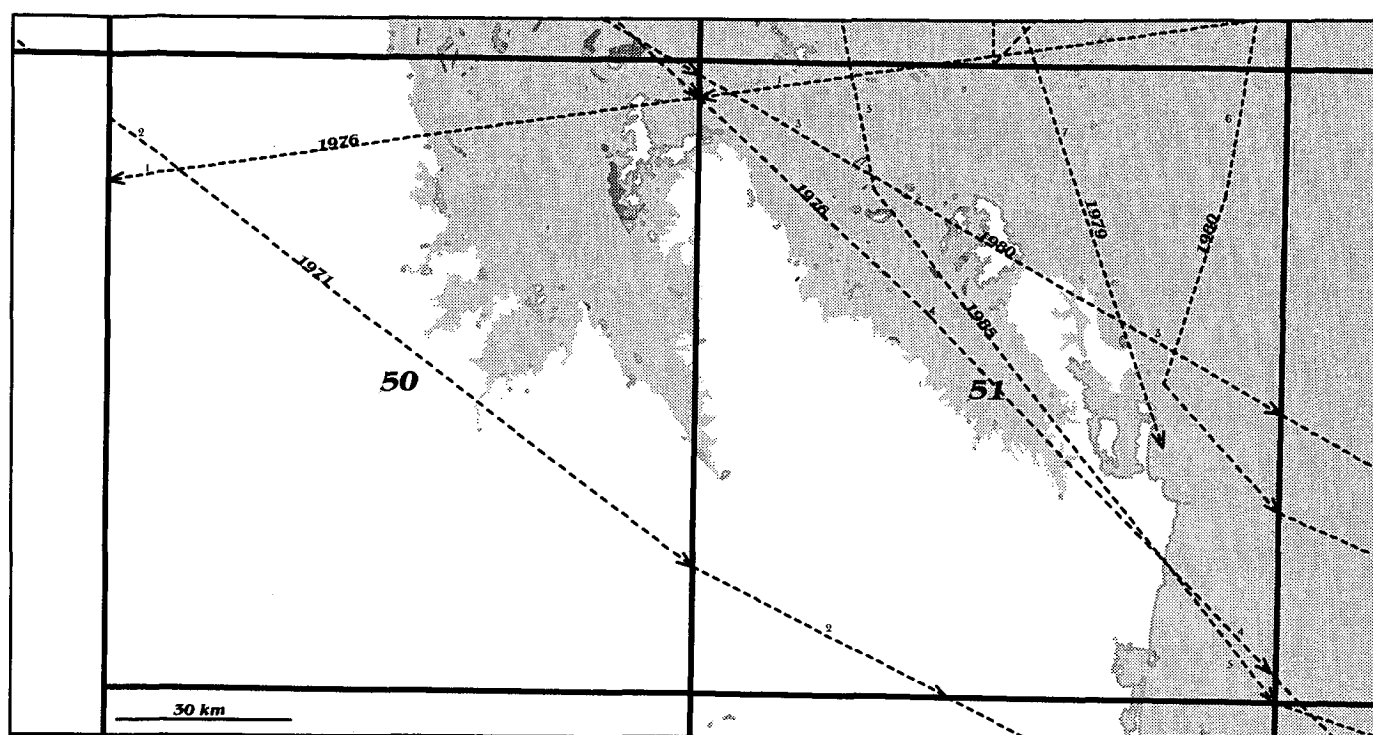
Map 120: All cyclone paths passing between 21-22°S and 150-152°E from 1969-1997.
The dashed lines show cyclone paths. The islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 48 and 49

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Watorea	1976	28 April	2	980 hPa
2	David	1976	19 January	3	965
3	Fran	1992	14-15 March	2	975
4	Emily	1972	1 April	3	961
5	Lance	1984	7 April	0	996
6	Alice	1974	21 March	0	1000
7	Freda	1981	28 February	2	974

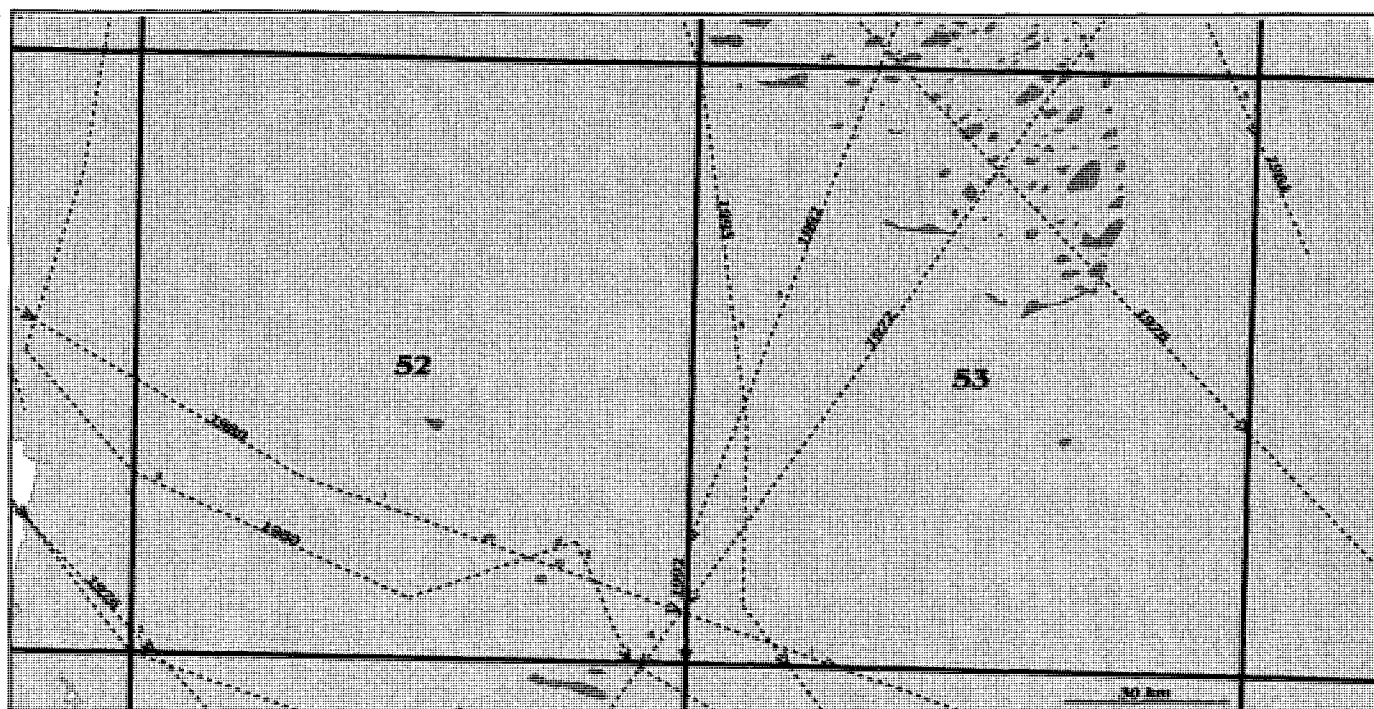
Map 121 : All cyclone paths passing between 21-22°S and 152-154°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 50 and 51

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	David	1976	19 January	3	961 hPa
2	Fiona	1971	21 February	1	995
3	Paul	1980	7 January	1	992
4	Dawn	1976	5 March	1	988
5	Pierre	1985	21-22 February	1	995
6	Simon	1980	23-24 February	3	950
7	Kerry	1979	5 March	0	998

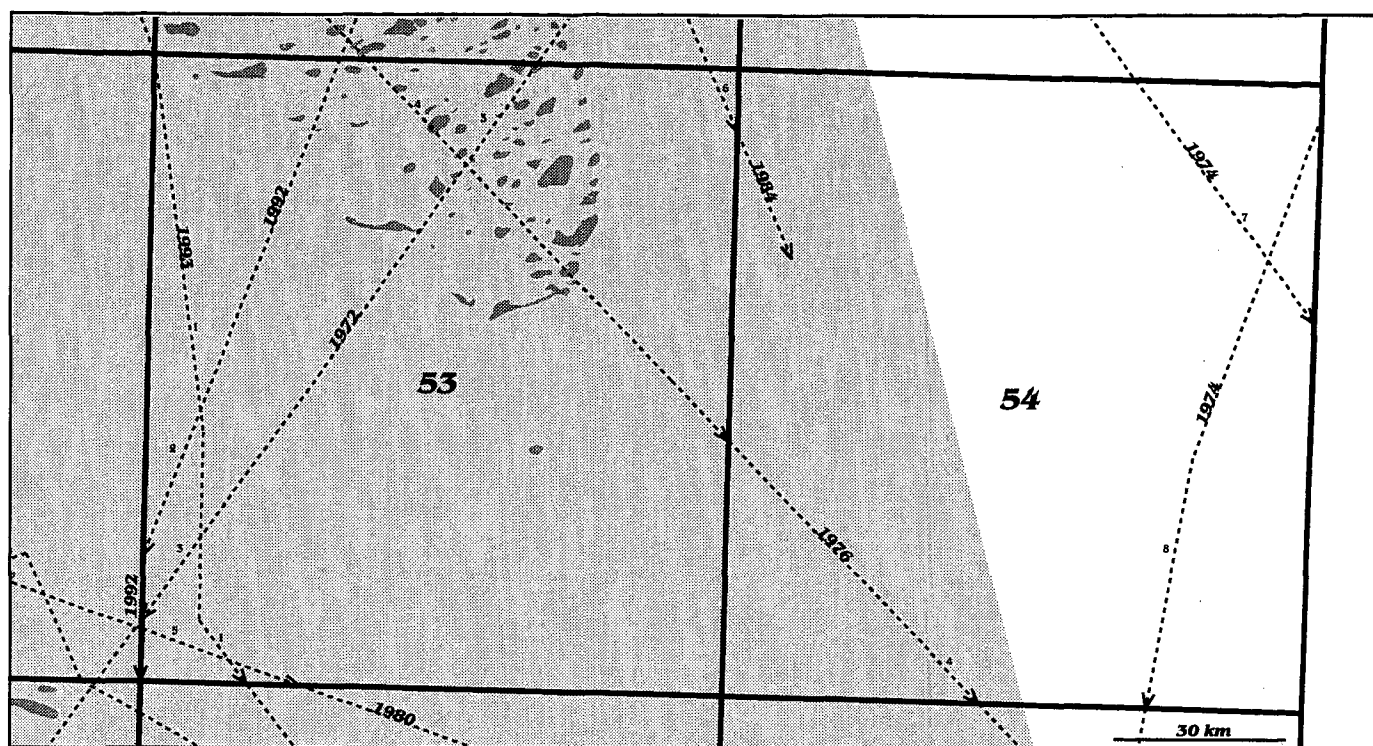
Map 122: All cyclone paths passing between 22-23°S and 149-151°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 52 and 53

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Paul	1980	7 January	1	992 hPa
2	Simon	1980	24 February	3	955
3	Dawn	1976	5 March	1	988
4	Rewa	1993	19 January	2	975
5	Fran	1992	15 March	2	985
6	Emily	1972	1 April	3	967
7	Watorea	1976	28 April	2	980
8	Lance	1984	7 April	0	998

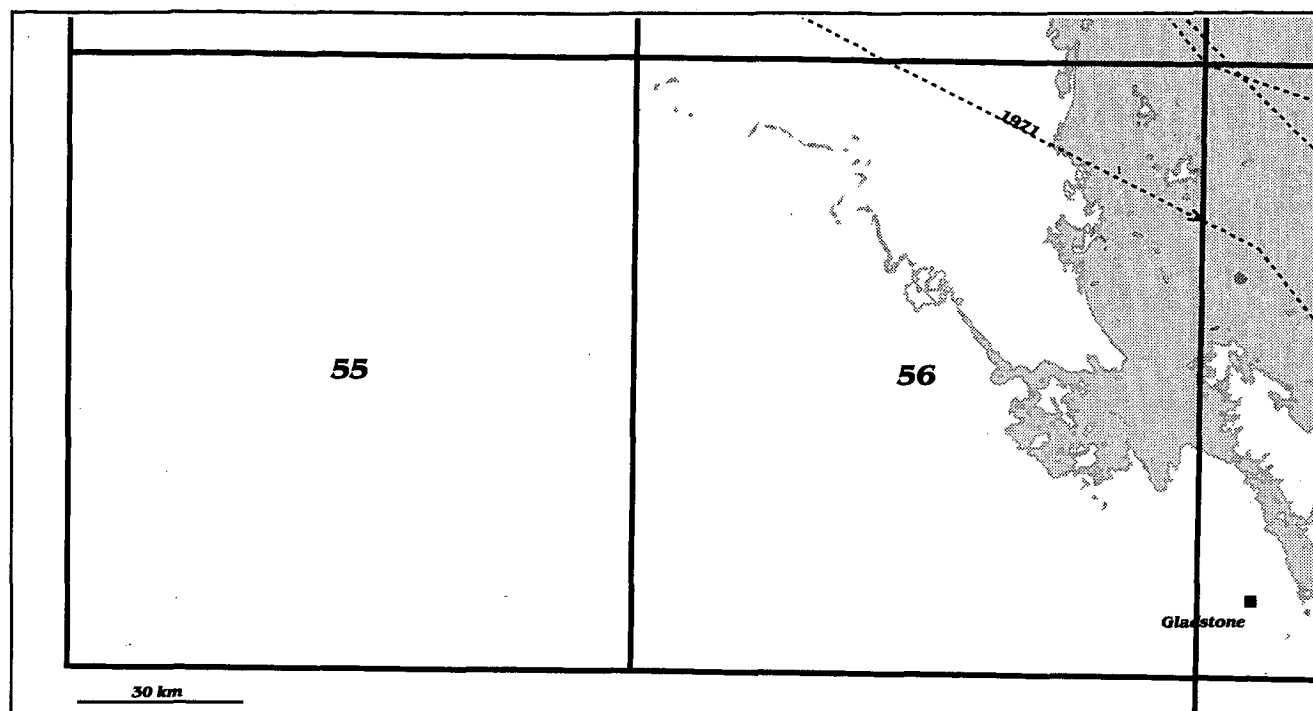
Map 123: All cyclone paths passing between 22-23° S and 151-153° E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 53 and 54

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Rewa	1993	19 January	2	975 hPa
2	Fran	1992	15 March	2	985
3	Emily	1972	1 April	3	967
4	Watorea	1976	28 April	2	980
5	Paul	1980	7 January	1	992
6	Lance	1984	7 April	0	998
7	Alice	1974	21 March	0	1000
8	Wanda	1974	23 January	0	999

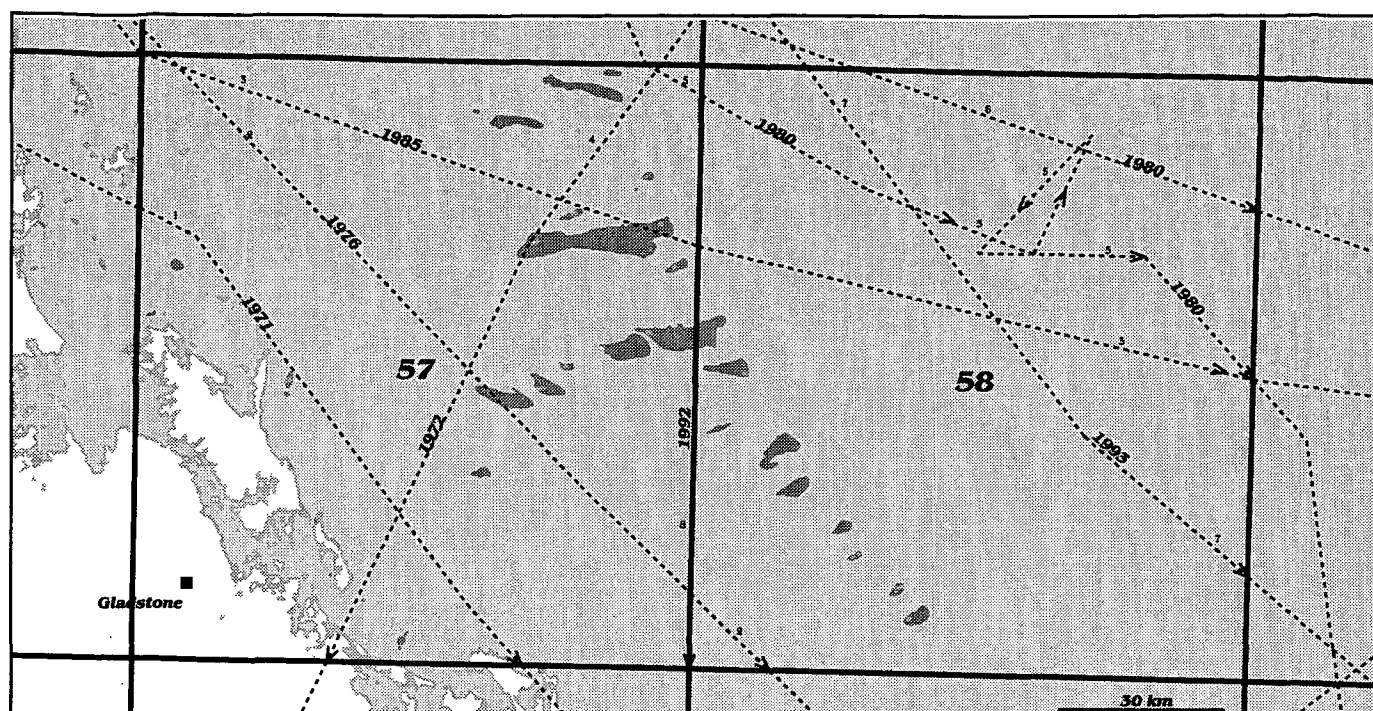
Map 124: All cyclone paths passing between 22-23°S and 152-154°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 55 and 56

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Fiona	1971	21 February	0	996 hPa

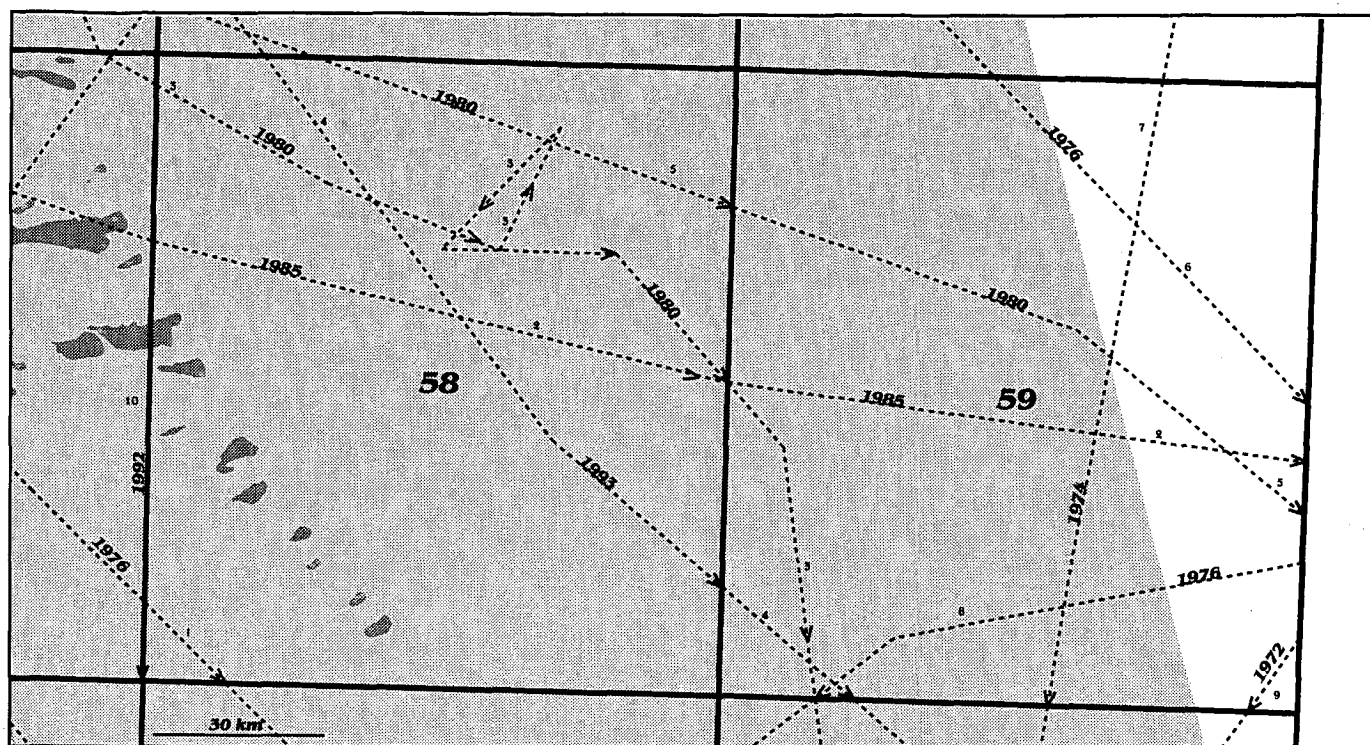
Map 125: All cyclone paths passing between 23-24° S and 149-151° E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 57 and 58

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Fiona	1971	21 February	0	996 hPa
2	Dawn	1976	5 March	1	998
3	Pierre	1985	22 February	0	999
4	Emily	1972	2 April	2	974
5	Simon	1980	25-26 February	3	960
6	Paul	1980	7 January	1	992
7	Rewa	1993	20 January	2	980
8	Fran	1992	15 March	2	980

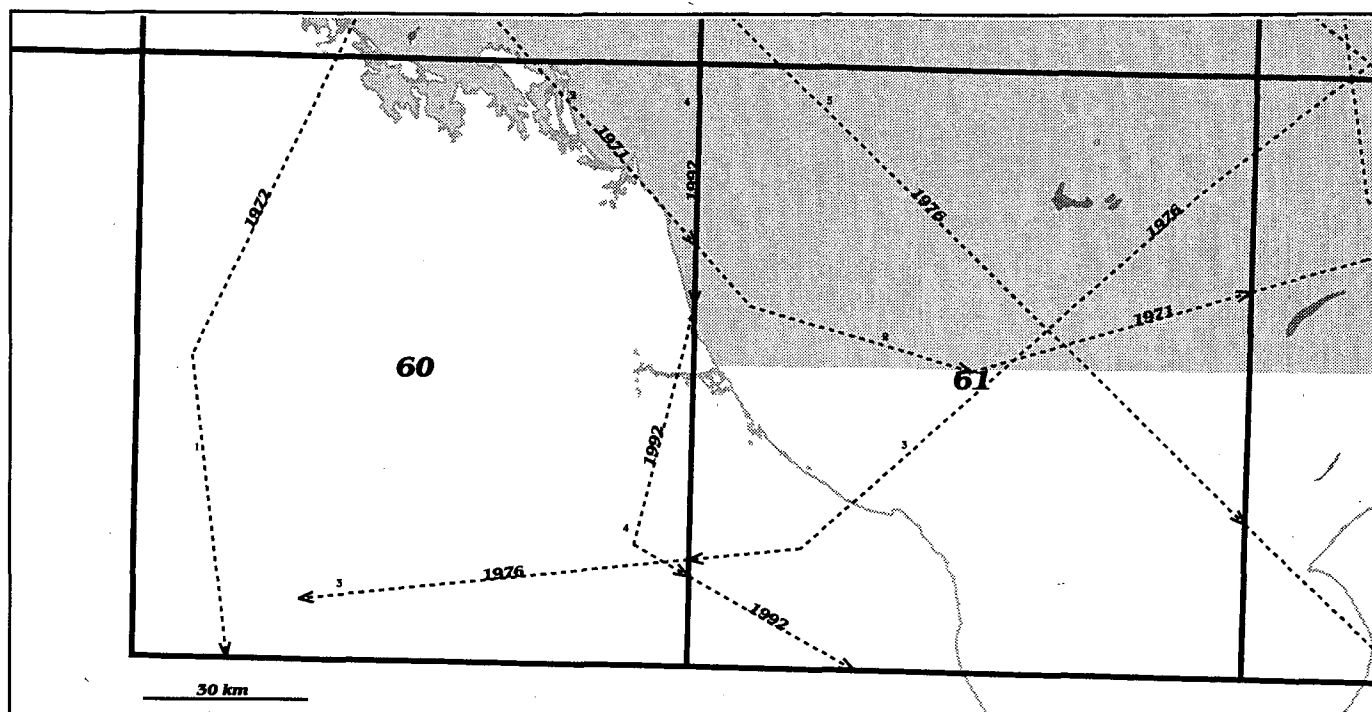
Map 126: All cyclone paths passing between 23-24° S and 151-153° E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 58 and 59

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Dawn	1976	5 March	1	988 hPa
2	Pierre	1985	22 February	0	1000
3	Simon	1980	25-26 February	3	960
4	Rewa	1993	20 January	2	980
5	Paul	1980	7 January	1	993
6	Watorea	1974	28 April	2	980
7	Wanda	1974	24 January	0	1000
8	Beth	1976	21 February	1	993
9	Daisy	1972	10-11 February	3	960
10	Fran	1992	15 March	2	980

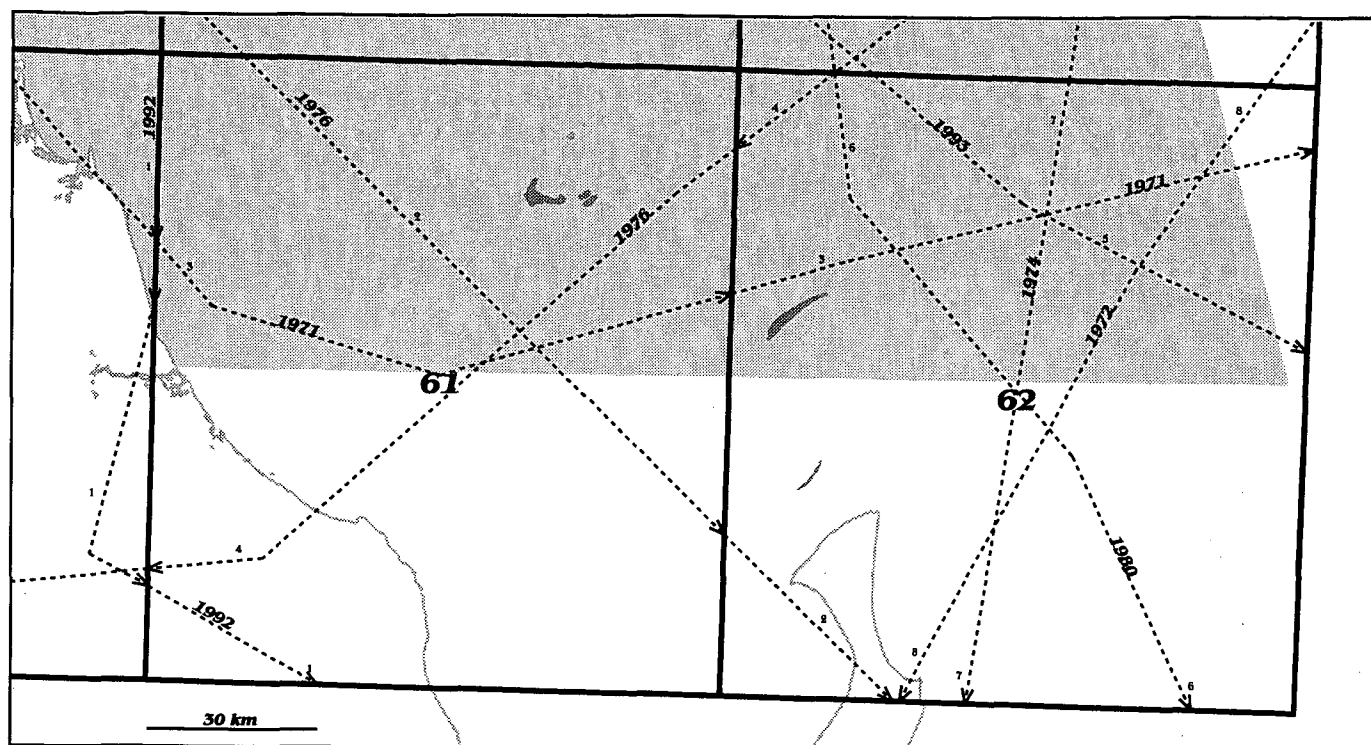
Map 127: All cyclone paths passing between 23-24°S and 152-154°E from 1969-1997.
The dashed lines show cyclone paths. The GBR Region is shaded light gray and reefs dark gray.



Map Boxes 60 and 61

<i>ID</i>	<i>Name</i>	<i>Year</i>	<i>Dates</i>	<i>Maximum Category</i>	<i>Minimum Central Pressure</i>
1	Emily	1972	2 April	1	993 hPa
2	Fiona	1971	22 February	1	994
3	Beth	1976	21-22 February	1	994
4	Fran	1992	15-16 March	2	980
5	Dawn	1976	5 March	1	988

Map 128: All cyclone paths passing between 24-25°S and 151-153°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.



Map Boxes 61 and 62

ID	Name	Year	Dates	Maximum Category	Minimum Central Pressure
1	Fran	1992	15-16 March	2	980 hPa
2	Dawn	1976	5 March	1	988
3	Fiona	1971	22 February	1	994
4	Beth	1976	21-22 February	1	994
5	Rewa	1993	20 January	2	980
6	Simon	1980	26-27 February	3	960
7	Wanda	1974	24 January	0	1000
8	Daisy	1972	11 February	3	963

Map 129: All cyclone paths passing between 24-25°S and 152-154°E from 1969-1997.
The dashed lines show cyclone paths. The mainland and islands are shaded white, the GBR Region light gray and reefs dark gray.

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APPENDIX A:
LIST OF NAMED REEFS BY 1° LATITUDE / 1° LONGITUDE BOX

Listed below are all *named* reefs located within each 1° latitude / 1° longitude box (see Map 2). Also listed for each box is the range of unique reef identification numbers (from the GBRMPA reef gazette) covered. These unique reef ID's roughly correspond to each reef's latitude. Note that 1) a single reef may fall within more than one box, and 2) some boxes contain no reefs.

Box 1 10300 - 10800

Albany Island Reef A
Albany Island Reef B
Albany Island Reef C
Alpha Rock Reef
Ariel Bank
Brewis Island Reef
Four Fathom Patches
Harrington Reef
Harrington Shoal
Ida Island Reef
Mai Islet Reef
Meggi-Damun Reef
North Ledge Reef
Shortland Reef
South Brother Rock Reef
South Ledge Reef
Tern Island Reef
Turtle Head Island Reef A
Turtle Head Island Reef B
Turtle Island Reef
Wyborn Reef

Box 2 10801 - 11063

Aylings Reef
Basslet Reef
Linda Reef
Triangle Reef

Box 3 10391 - 10428

Triangle Reef

Box 5 10801 - 11800

Arnold Islet Reef
Bushy Island Reef
Cairncross Islets Reef
Douglas Islet Reef
Gilmore Bank
Halfway Islet Reef
Hannibal Islets Reef
Hunter Reefs
Macarthur Islands Reef
Niggerhead Reef

Pearn Rock Reef
Pirie Islet Reef

Box 6 10419 - 12031

Ashmore Banks
Bird Islands Reef
Boydong Island Reef
Bremner Shoal
Brierly Reef
Cape Grenville Reef A
Cape Grenville Reef B
Cape Grenville Reef C
Chimmo Shoal
Cholmondeley Islet Reef
Christmas Reef
Clerke Island Reef
Cockburn Patch
Cockburn Reef
Collette Reef
Douglas Islet Reef
Erlangen Patch
Five Reefs
Forty Winks Reef
Forwood Reef
Four Reef
Gore Island Reef
Great Detached Reef A
Great Detached Reef C
Great Detached Reef D
Guthray Reef
Harvey Island Reef
Hicks Island Reef
Jardine Islet Reef
Job Reef
Jukes Reef
Little Boydong Islet Reef
Maclennan Cay Reef
Magra Islet Reef
Mason Reef
McGillivray Reef
McSweeney Reef
Middle Banks Reef B

Middle Banks Reef C
 Middle Banks Reef
 Middle Reef
 Milman/Aplin Islets Reef
 Monsoon Reef
 Nob Island Reef
 Onslow Reef
 Outer Reef
 Paluma Shoal
 Parsons Reef
 Passage Reef
 Perry Island Reef
 Queue Reef
 Rodney Island Reef
 Sinclair Islet Reef
 Sir Charles Hardy Islands Reef
 South Bird Islands Reef
 South Reef
 Star Reef
 Sunday Island Reef
 Three Reefs
 Thrush Reef
 Turning Point Patches Reef
 Twin Reefs
 Viking Reef
 Wallace Islet Reef
 Wilds Shoal
 Wizard Reef
 Wreck Reef
 Yule Detached Reef

Box 7 *10418 - 11245*

Great Detached Reef A
 Great Detached Reef B
 Great Detached Reef C
 Great Detached Reef D
 Pandora Reef
 Raine Island Reef
 Yule Detached Reef

Box 9 *11193 - 13001*

Allen Reef
 Andrew Reef
 Ape Reef
 Bannan Reef
 Beesley-Baird Islets Reef
 Bligh Reef
 Bunker Reef
 Burke Reef
 Cat Reef
 Chapman Island Reef
 Curd Reef

Daniell Reef
 Dolphin Reef
 Edward Shoals
 Eel Reef
 Exit Reef
 Ferguson Reef
 First Small Reef
 Fison Reefs
 Forbes Islands Reef
 Frederick Patches
 Gallon Reef
 Haggerstone Island Reef
 Hammond Reef
 Hazel Reef
 Hazelgrove Reefs
 Henry Reef
 Inset Reef
 Kangaroo Shoals
 Kay Reef
 Kemp Rocks Reef
 Lagoon Reef
 Lansdown Reef
 Laurel Reef
 Lion Reef
 Lloyd Islands Reef
 Lloyds Reef
 Log Reef
 Long Sandy Reef
 Mantis Reef
 Martha Ridgway Reef A
 Martha Ridgway Reef B
 Mason Reef
 May Reef
 Middle Reef
 Moody Reef
 Nomad Reef
 North Pint Patch
 Northern Small Detached Reef
 Pickard Reef
 Pigeon Island Reef
 Piper Reef
 Quoin Island Reef
 Restoration Island Reef
 Restoration Rock Reef
 Rocky Island Reef
 Second Small Reef
 Sherrard Island Reef
 South Pint Patch
 South Reef
 Southern Small Detached Reef
 Sunk Reef
 Sunter Islet Reef

Tannadice Shoal
Twin Reefs
Tyrrel Reefs
Waight Bank
William Reef
William Reef
Wishbone Reef
Wye Reef
Young Reef
Zenith Reef

Box 12 *12143 - 14003*

Ballerina Shoal
Bell Bank
Binstead Island Reef
Blanchard Reef
Bow Reef
Burkitt Island Reef
Cat Reef
Celebration Reef
Colclough Reef
Dart Shoal
Derry Reef
Diamond Reign Reefs
Drake Shoals
Ellis Reef
Es Reef
Fife Island Reef
Franklin Reef
Frenchman Reef
Gertrude Reef
Glennie Reef
Grub Reef
Ham Reef
Hannah Island Reef
Hay Island Reef
Heath Reef
Hedge Reef
Hedge Reef
Iris Reef
Jubilee Reef
Kestrel Reef
Lowrie Island Reef
Lytton Reef
MacDonald Reef
Macnamara Patch
Magpie Reef
Morris Island Reef
New Reef
Night Island Reef
Noddy Reef A
Noddy Reef B

Noddy Reef C
North Kandalla Shoal
Obree Reef
Ogilvie Reef
Osborne Reef
Pelican Island Reef
Poulsen Rock
Quake Reef
Rattlesnake Reef A
Rattlesnake Reef B
Rattlesnake Reef C
Roskrug Reef
Sand Bank No. 7 Reef
Sand Bank No. 8 Reef
Sharland Reefs
South Kandalla Shoal
Stork Reef
Suchen Reef
Sullivan Shoal
Sykes Reef
Throne Shoals
Tijou Reef
Treat Reef
Wasp Reef
Waterwitch Reef
Wilkie Island Reef
Wilsen Shoal

Box 13 *13073 - 14034*

Corbett Reef
Creech Reef A
Creech Reef B
Davie Reef
Eves Reef
Grub Reef
Hedge Reef
Joan Reef
Rodda Reef
Sand Bank No 5 Reef
Scooterboot
Steene Reef
Tydeman Reef
Wilson Reef

Box 15 *14001 - 14022*

Beabey Patches
Cameron Shoal
Clark Shoal
Cliff Islands Reef
Eden Reef
Fahey Reef
Grub Reef

June Reef
Keast Shoal
Olive Patch
Taiwan Shoal
Wharton Reef

Box 16 *14003-14160*

Atkinson Reef
Aylen Patch
Baron Reef
Barrow Islands Reef
Beatrice Reef
Bewick Island Reef
Blackwood Island Reef
Boulder Rock Reef
Broomfield Rock Reef
Cape Rock Reef
Channel Rocks Reef
Clack Reef
Combe Reef
Coquet Island Reef
Corbett Reef
Corbett Reef
Davy Patches A
Davy Patches B
Davy Patches C
Denham Island Reef
Flinders Island Reef A
Flinders Island Reef B
Flinders Island Reef C
Flinders Rock
Grub Reef
Hales Island Reef
Hampton Island Reef
Houghton Island Reef
Howick Island Reef
Ingram & Beanley Islands Reef
King Island Reef
Leggatt Island Reef
Maclear Island Reef
Megaera Reef
Melanie Patches
Mid Reef
Miles Reef A
Miles Reef B
Munro Reef
Murdoch Island Reef
Newton Island Reef
Noble Island Reef
North Warden Reef
Oswald Shoal

Pipon Islands Reef
Pipon Shoal
Rocky Islets Reef A
Rocky Islets Reef B
Rocky Ledges Reef
Rocky Point Island Reef
Sand Bank No. 1 Reef
Sand Islet Reef
Scooterboot
Sinclair/Morris Island Reef
Singleton Shoal
South Warden Reef
Stanley Island Reef A
Stanley Island Reef B
Stanley Island Reef C
Stanley Island Reef D
Stanley Island Reef E
Stapleton Islet Reef
Switzer Reef
Unison Reef
Watson Island Reef
Wedge Rocks Reef
Weigall Reef A
Weigall Reef B
Wharton Reef
Wooden Patch

Box 17 *14073 - 14154*

Carter Reef
Covered Reef
Crescent Reef
Crompton Shoal
Day Reef
Decapolis Reef
Eye Reef
Eyrie Reef
Fly Reef
Gunga Shoal
Helsdon Reef
Hicks Reef
High Rock Reef
Hilder Reef
Jewell Reef
Kedge Reef
Linnet Reef
Lizard Island Coconut Bay Reef
Lizard Island Lagoon Reef
Lizard Island NE Side Reef
Lizard Island NW Side Reef
MacGillivray Reef
Martin Reef
Maxwell Reef

No Name Reef
 North Direction Island Reef
 Nymph Island Reef
 Parke Reef
 Pethebridge Islets Reef A
 Pethebridge Islets Reef B
 Petricola Shoal
 Ribbon Reef No.10
 Ribbon Reef No.9
 Rocky Islets Reef A (northern)
 Rocky Islets Reef B (northern)
 Sim Reef
 Snake Reef
 South Direction Island Reef
 Stewart Shoal
 Turtle Group Reef A
 Turtle Group Reef B
 Turtle Group Reef C
 Turtle Group Reef D
 Turtle Group Reef E
 Turtle Group Reef F
 Turtle Group Reef G
 Turtle Group Reef H
 Turtle Group Reef I
 Turtle Reef A
 Turtle Reef B
 Underwood Shoal
 Waining Reef
 Yonge Reef

Box 19 *14154 - 15099*

Ada Bank
 Agincourt Reef No.4
 Agincourt Reefs No.3
 Andersen Reef
 Bee Reef
 Beor Reef
 Blackbird Patches
 Boulder Reef
 Cairns Reef
 Conical Rock Reef
 Cowlshaw Reef
 Dawson Reef
 Delius Patch
 Draper Patch
 East Hope Island Reef
 Egret Reef
 Emily Reef
 Endeavour Reef
 Escape Reef
 Evening Reef
 Forrester Reef

Gill Patches
 Gubbins Reef
 Gull Reef
 Harrier Reef
 Irene Reef
 Lake Reef
 Lark Reef
 Lena Reef
 Long Reef
 Low Wooded Island Reef
 Mackay Reefs
 Malcolm Patch
 Marx Reef
 Morning Reef
 Murray Reef A
 Murray Reef B
 Murray Reef C
 Osterland Reef
 Ottaway Patch
 Pasco Reef
 Pearl Reef
 Petty Patch
 Pickersgill Reef
 Pullen Reefs
 Ribbon Reef No.1
 Ribbon Reef No.2
 Ribbon Reef No.2
 Ribbon Reef No.2
 Ribbon Reef No.3
 Ribbon Reef No.4
 Ribbon Reef No.5
 Ribbon Reef No.6
 Ribbon Reef No.7
 Ribbon Reef No.8
 Ribbon Reef No.9
 Rocky Island Reef (middle)
 Rosser Reef
 Ruby Reef
 Startle Reef
 Stonor Patch
 Strickland Reef
 Swinger Reef
 Three Isles Reef
 Tilbrook Bank
 Two Isles Reef
 West Hope Island Reef
 Williamson Reefs

Box 21 *15069 - 16082*

Agincourt Reef D
 Agincourt Reef No.1
 Agincourt Reef No.2

Agincourt Reefs No.3
 Alexandra Reef
 Arlington Reef
 Batt Reef
 Chinamen Reef
 Double Island Reef
 Egmont Reef
 Fitzroy Island Reef
 Garioch Reef
 Green Island Reef
 Hastings Reef
 Haycock Island Reef
 Korea Reef
 Linden Bank
 Little Fitzroy Island Reef
 Low Isles Reef
 Mackay Reef
 Michaelmas Reef
 Middle Cay Reef A
 Morey Reef
 Morning Reef
 Norman Reef
 Opal Reef
 Oyster Reef
 Pixie Reef
 Rudder Reef
 Satellite Reef
 Saxon Reef
 Snapper Island Reef
 Spitfire Reef
 St Crispin Reef
 Tongue Reef
 Undine Reef A
 Undine Reef B
 Unity Reef
 Upolu Cay Reef
 Vlasoff Reef
 Wentworth Reef
 Yule Reef

Box 22 *16030 - 17001*

Arlington Reef
 Baines Patches
 Briggs Reef
 Channel Reef
 Elford Reef
 Euston Reef
 Fin Reef
 Flynn Reef
 Green Island Reef
 Hastings Reef
 Hope Reef

Jenny Louise Shoal A
 Jenny Louise Shoal B
 Linden Bank
 Little Fitzroy Island Reef
 Michaelmas Reef
 Milln Reef
 Moore Reef
 Nicholas Reef
 Norman Reef
 North West Reef
 Onyx Reef
 Outer Shoal
 Pellowe Reef
 Pretty Patches
 Saxon Reef
 Spur Reef
 Sudbury Reef
 Thetford Reef
 Vlasoff Reef

Box 24 *17001 - 18018*

Adelaide Reef
 Arthur Patches
 Beaver Reef
 Cayley Reef
 Coates Reef
 Dunk Island Reef
 Eddy Reef
 Ellison Reef
 Farquarson Reef A
 Farquarson Reef B
 Feather Reef
 Flora Reef
 Gibson Reef
 Gilbey Reef
 Goudge Bank
 Hall-Thompson Reef
 Hedley Reef
 Hervey Shoals A
 Hervey Shoals B
 Howie Reef
 Jackson Patches
 Jones Patch
 King Reef
 Lindquist Island Reef
 Maori Reef
 McCulloch Reef
 Moss Reef
 Mustard Patches A
 Mustard Patches B
 Nathan Reef
 Noggin Reef

Noreaster Reef
 Normanby Island Reef A
 North Barnard Islands Reef
 Otter Reef
 Peart Reef
 Potter Reef A
 Potter Reef B
 Potter Reef C
 Publicans Shoals (North)
 Publicans Shoals (South)
 Raaf Shoals
 Round Island Reef
 Scott Reef
 South Barnard Islands Reef
 Stagg Patches A
 Stagg Patches B
 Stevens Reef
 Sudbury Reef
 Surprise Shoal
 Taylor Reef
 Thorpe Island Reef
 Tobias Spit
 Wardle Reef
 Yamacutta Reef

Box 28 *17069 - 18066*

Acheron Island Reef
 Barnett Patches
 Bramble Reef
 Brisk Islands Reef
 Britomart Reef
 Brook Islands Reef
 Brook Shoal
 Coombe Island Reef
 Curacoa Island Reef A
 Curacoa Island Reef B
 Duncan Reef
 Eclipse Island Reef
 Esk Island Reef
 Eva Island Reef
 Fantome Island Reef
 Fly Island Reef
 Garden Island Reef
 Goold Island Reef
 Great Palm Island Reef A
 Great Palm Island Reef B
 Great Palm Island Reef C
 Great Palm Island Reef D
 Great Palm Island Reef E
 Great Palm Island Reef F
 Great Palm Island Reef G
 Havannah Island Reef

Hudson Island Reef
 Kelso Reef
 Kennedy Shoal
 Lady Elliot Reef
 Little Kelso Reef
 Orpheus Island Reef A
 Orpheus Island Reef B
 Orpheus Island Reef C
 Orpheus Island Reef D
 Orpheus Island Reef E
 Otter Reef
 Pandora Reef
 Pelorus Island Reef
 Rib Reef
 Richards Island Reef
 Smith Island Reef
 Trunk Reef
 Wheeler Island Reef

Box 29 *18030 - 18121*

Anzac Reef
 Arab Reef
 Arc Reef
 Big Broadhurst Reef A
 Big Broadhurst Reef B
 Bowl Reef
 Centipede Reef
 Chicken Reef
 Coil Reef
 Cup Reef A
 Cup Reef B
 Davies Reef
 Dip Reef
 Faraday Reef
 Fork Reef
 Glow Reef
 Grub Reef
 Hall Reef A
 Hall Reef B
 Helix Reef
 Hopkinson Reef
 Hopkinson Shoal
 John Brewer Reef
 Keeper Reef
 Kelso Reef
 Knife Reef
 Little Broadhurst Reef
 Little Kelso Reef
 Lodestone Reef
 Lynchs Reef
 Myrmidon Reef
 Needle Reef

Pith Reef
Saucer Reef
Slashers No.1 Reef
Slashers No.2 Reef
Spoon Reef A
Spoon Reef B
Thimble Shoal
Thread Shoal
Urchin Shoal
Wheeler Reef
Yankee Reef

Box 30 *18107 - 19024*

Eagle Reef
Jaguar Reef
Jupiter Reef
Lion Reef
Prawn Reef
Shrimp Reef
Viper Reef

Box 32 *19002 - 19012*

Cockle Bay Reef
Herald Island Reef
Magnetic Island Reef B
Magnetic Island Reef C
Magnetic Island Reef D
Magnetic Island Reef E
Magnetic Island Reef F
Magnetic Island Reef G
Middle Reef
Paluma Shoals
Rattlesnake Island Reef
Virago Shoal

Box 33 *19013 - 19102*

Bowden Reef
Camp Islet Reef
Morinda Shoal
Pakhoi Bank
Salamander Reef
Tink Shoal
Wilson Shoal

Box 34 *19024 - 19113*

Castor Reef
Charity Reef
Cobham Reef A
Cobham Reef B
Croton Reef
Darley Reef
Dingo Reef A

Dingo Reef B
Dingo Reef C
Dingo Reef D
Dingo Reef E
Dingo Reef F
Fairey Reef A
Fairey Reef B
Fairey Reef C
Faith Reef
Gould Reef A
Gould Reef B
Gould Reef C
Gould Reef D
Gould Reef E
Holbourne Island Reef
Holbourne Island Reef
Hope Reef
Jacqueline Reef
Kangaroo Reef A
Kangaroo Reef B
Leopard Reef
Lynx Reef
Martin Reef
Mid Reef
Net Reef
Old Reef
Pollux Reef
Prawn Reef
Rattray Island Reef
Seagull Reef
Shell Reef
Showers Reef
Stanley Reef
Tiger Reef
Tobias Reef
Wallaby Reef

Box 35 *19069 - 19206*

Bait Reef
Black Reef East
Black Reef
Crab Reef
Elizabeth Reef
Ellen Reef
Eulalie Reef
Gargoyle Reef
Hardy Reef
Hewitt Reef
Hook Reef A
Hook Reef B
Hook Reef C
Joist Reef

Kennedy Reef
 Knuckle Reef
 Lath Reef
 Line Reef
 Little Reef
 Napier Reef
 Net Reef
 Oublier Reef
 Plaster Reef
 Rafter Reef
 Ross Reef
 Round Reef
 Seagull Reef
 Sinker Reef
 Stucco Reef
 Tideway Reef A
 Tideway Reef B
 Tideway Reef C

Box 36 *19206 - 20113*

Abbott Reef
 Ben Reef
 Blossom Bank
 Bond Reef
 Ferris Shoal
 Hyde Reef
 James Reef
 Marilyn Shoal
 Maschke Shoal
 Mc Intyre Reef
 Oom Reef
 Rebe Reef
 Sharon Shoal A
 Sharon Shoal B
 Sharon Shoal C
 Sharon Shoal D
 Thompson Shoal
 Wackett Reef
 White Tip Reef
 Williams Reef
 Wyatt Earp Reef

Box 39 *20001 - 20409*

Alert Bank
 Armit Islets Reef
 Bennett Rock
 Black Current Island Reef
 Black Island Reef
 Carpet Snake Island Reef
 Cave Island Reef
 Chyebassa Shoal
 Cid Island Reef

Condor Shoal
 Cow Island Reef
 Croaker Rock Reef
 Defiance Reefs
 Defiance Reefs
 Dent Island Reef
 Double Cone Island Reef
 Eshelby Island Reef
 Fish Reef
 Gloucester Island Reef
 Gould Island Reef
 Grassy Island Reef
 Gumbrell Island Reef
 Hamilton Island Reef A
 Hamilton Island Reef B
 Hayman Island Reef
 Henning Island Reef
 High Islands Reef A
 High Islands Reef B
 Hook Island Reef A
 Hook Island Reef B
 Hook Island Reef C
 Hook Island Reef D
 Hook Island Reef E
 Hook Island Reef F
 Hook Island Reef G
 Hook Island Reef H
 Hook Island Reef I
 Langford and Bird Islands Reef
 Long Island Reef A
 Long Island Reef B
 Long Island Reef C
 Long Island Reef D
 Long Island Reef E
 Long Island Reef F
 Long Shoal
 Low Islet Reef
 Low Rock Reef
 Mausoleum Island Reef
 Midge Island Reef
 Newry Island Reef
 North Head Reef
 North Molle Island Reef
 North Repulse Island Reef
 Olden Island Reef
 Pigeon Island Reef
 Pigeon Islet Reef
 Planton Island Reef
 Rabbit Island Reef
 Redcliffe Islands Reef
 Repair Island Reef
 Roseric Shoal

Ross Islet Reef
 Saddleback Island Reef
 Shute Island Reef
 South Molle Island Reef
 Stone Island Reef
 Tancred Island Reef
 Three Fathom Patch
 U/N (Plum Pudding Island Reef)
 West Molle Island Reef
 Whitsunday Island Reef A
 Whitsunday Island Reef B
 Whitsunday Island Reef C
 Whitsunday Island Reef H
 Whitsunday Island Reef I
 Whitsunday Island Reef J
 Whitsunday Island Reef K
 Whitsunday Island Reef L
 Whitsunday Island Reef M
 Whitsunday Island Reef N
 Winter Shoal

Box 40 *19205 - 20407*

Baxendell Shoal
 Bellows Island Reef
 Blackcombe Island Reef
 Bolton Shoal
 Border Island Reef A
 Border Island Reef B
 Border Island Reef C
 Brampton Island Reef
 Bullion Rocks Reef
 Carlisle Island Reef
 Carondelet Rock Reef
 Cashell Rock Reef
 Chrome Rock Reef
 Cockermouth Island Reef
 Cole Island Reef
 Comston Island Reef
 Coppersmith Rock Reef
 Credlin Reefs
 Deloraine Island Reef
 Dumbell Island Reef
 Edgell Reefs
 Fantome Rocks Reef
 Filmoy Shoal
 Forge Rocks Reef
 Geranium Shoal
 Goldsmith Island Reef A
 Goldsmith Island Reef B
 Goldsmith Island Reef C
 Goldsmith Island Reef D
 Green Island Reef

Harold Island Reef
 Haslewood Island Reef A
 Haslewood Island Reef B
 Haslewood Island Reef C
 Haslewood Island Reef D
 Haslewood Island Reef E
 Hyde Rock Reef
 Ingot Islets Reef
 Keswick Island Reef A
 Keswick Island Reef B
 Keswick Island Reef C
 Keyser Island Reef
 Leeper Shoal
 Lindeman Island Reef A
 Lindeman Island Reef B
 Lindeman Island Reef C
 Lindeman Island Reef D
 Linne Island Reef A
 Linne Island Reef B
 Little Lindeman Island Reef
 Locksmith Island Reef
 Long Rock Reef
 Lupton Island Reef
 Parker Reef
 Peta Patches
 Seaforth Island Reef
 Shaw Island Reef A
 Shaw Island Reef B
 Shaw Island Reef C
 Shaw Island Reef D
 Shaw Island Reef E
 Shaw Island Reef F
 Shaw Island Reef G
 Shaw Island Reef H
 Sidney Island Reef
 Silloth Rocks Reef
 Silversmith Island Reef
 Specie Shoal
 Square Reef
 St. Bees Island Reef A
 St. Bees Island Reef B
 St. Bees Island Reef C
 Thomas Island Reef
 Tideway Reef A
 Tideway Reef B
 Tinsmith Island Reef
 Volskow Island Reef
 Wedge Island Reef
 Wheatley Shoal
 Whitsunday Island Reef C
 Whitsunday Island Reef D
 Whitsunday Island Reef E

Whitsunday Island Reef F
Whitsunday Island Reef G
Wigton Island Reef A
Wigton Island Reef B

Box 41 20111 - 20402

Bax Reef
Ben Reef
Big Stevens Reef
Boulton Reef
Briggs Reef
Bugatti Reef
Cannan Reef
Chauvel Reef A
Chauvel Reef B
Cockatoo Reef
Cockatoo Reef
Cole Reef A
Cole Reef B
Creal Reef
Gable Reef A
Gable Reef B
Hunt Reefs
Hunt Reefs
Liff Reefs
Little Bugatti Reef
Little Stevens Reef
McIntyre Reef
Molar Reef
Nixon Reef
Packer Reefs
Paterson Shoal
Pompey Reef
Redbill Island Reef
Robertson Reefs (1)
Robertson Reefs (2)
Robertson Reefs (3)
Robertson Reefs (4)
Sheriff Shoal
Southampton Reef
Tern Island Reef
Warland Reef
Wup Reef

Box 42 20321 - 21142

Cockatoo Reef
Cockatoo Reef

Box 43 20393 - 21192

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Box 45 21002 - 22003

Alexandra Reef
Aquila Island Reef
Avoid Island Reef
Beaver Shoal
Beware Rocks Reef
Boomerang Shoal
Channel Islet Reef
Connor Islet Reef
Coral Point Reef
Cullen Islet Reef
Curlew Island Reef
Douglas Islet Reef
Downward Patches
Drumfish Shoal
Edwards Shoal
Escape Cay Reef
Ethel Sand Reef
Fairfax Rock Reef
Fanning Shoal
Ferdinand Shoal
Festing Shoal
Flat Top Island Reef
Freshwater Point Reef
George Island Reef
Glendaver Point Reef
Harry Shoal A
Harry Shoal B
Hay Reef
Holt Shoal
Kilgour Shoal
Lake Shoals
Lloyd Shoal
Middle Shoal
Morning Cay Reef
North Patch Reef
Oom Shoal
Park Shoal
Paxton Shoal
Pearl Shoal
Penrith Island Reef
Phillips Reef
Planter Shoal
Poynter Island Reef
Prudhoe Shoal
Race Rocks Reef
Red Clay Island Reef
Reef Islet Reef
Sandy Shoal A
Sandy Shoal B
Slattery Shoal
Smythe Shoals

Snake Cays Reef A
 Snake Cays Reef B
 South Patch Reef
 Stony Shoal
 Temple Island Reef
 Temple Islets Reef
 Tinonee Bank
 Tinonee Peak Island Reef
 Torch Shoal
 Tupper Shoal
 Turn Island Reef
 Victor Islet Reef
 Viscount Shoal A
 Viscount Shoal B
 Viscount Shoal C
 Waratah Shoal
 West Hill Island Reef
 West Reef
 Wild Duck Island Reef
 Williams Shoal
 Yaralla Shoal

Box 46 20351 - 21593

Alarm Reef
 Bamborough Island Reef A
 Bamborough Island Reef B
 East Spur Reef
 Howard Islet Reef
 Hunter Island Reef A
 Hunter Island Reef B
 Iron Islet Reef
 Marble Island Reef
 Middle Island Reef
 North East Island Reef
 Owens Shoal
 Pine Islets Reef
 Pine Peak Island Reef
 Prince Reef
 Sandpiper Reef
 South East Islets Reef
 South Island Reef A
 South Island Reef B
 Tynemouth Island Reef A
 Tynemouth Island Reef B
 West Spur Reef
 Whites Bay Reef

Box 47 20388 - 21592

Adroit Shoal
 Bell Cay Reef
 Herald Reef Prong
 Heralds Prong No.2 Reef

Heralds Prong No.3 Reef
 Lavers Cay Reef
 Riptide Cay Reef
 Storm Cay Reef
 Twin Cays Reef

Box 48 20400 - 22103

Banana Cay
 Beacon Reef
 Bills Reef
 Blu-Lion Reef
 Centenary Cay Reef
 Central Reef
 Chinaman Reef
 Detour Reef
 East Cay Reef
 Elusive Reef
 Emperor Reef
 Foller Reef
 Frigate Cay Reef
 Gannett Cay Reef
 Half Moon Reef
 Half Tide Reef
 Heart Reef
 Hill Reef
 Houdini Reef
 Jenkins Reef
 Lavers Cay Reef
 Little Banana Reef
 Littles Reef
 Long Reef
 Mervs Reef
 Mystery Cay Reef
 Obstruction Reef
 Pike Reef
 Price Cay Reef
 Recreation Cay Reef
 Small Lagoon Reef
 Small Reef
 Triangle Reef
 Turner Cay Reef
 Turrum Cay Reef
 Turtle Reef
 Twin Cay Reef
 Wade Reef
 Zodiac Cay Reef

Box 50 21380 - 22028

Barren Islet Reef
 Boyle Reef
 Brooks Shoal
 Coal Island Reef

Escape Cay Reef
 Gull Cay Reef
 Infelix Islets Reef
 Long Island Reef
 McEwen Island Reef
 North Point Cays Reef
 Obstruction Shoal
 One Fathom Patch Reef
 Park Shoal
 Pilot Reef
 Roundish Island Reef
 Snake Cays Reef A
 Snake Cays Reef B
 South Barren Islet Reef
 Tide Island Reef
 Tornado Rocks Reef A
 Tornado Rocks Reef B
 Turtle Island Reef
 West Side Island Reef
 Wild Duck Island Reef

Box 51 21423 - 22167

Blind Rock Reef
 Clara Group Reef
 Collins Island Reef
 Connor Rock Reef
 Danger Island Reef
 Donovan Shoal
 Earl Banks
 Harrison Islet Reef
 Holt Island Reef
 Iron Islet Reef
 Leicester Island Reef
 Lingham Island Reef
 Marquis Island Reef
 Mumford Island Reef
 Osborn Island Reef
 Otterbourne Island Reef
 Pelican Rock Reef
 Ripple Islets Reef
 Rothbury Island Reef
 Round Rock Reef
 Shields Island Reef
 Ten Pin Rock Reef
 Triangular Island Reef
 Turn Shoal
 Tynemouth Island Reef B
 White Shoal

Box 52 22156 - 22160

Barcoo Bank
 Edgell Bank

Goodwin Shoal
 Karamea Bank
 Moresby Bank

Box 53 22084 - 22161

Abrahams Reef
 Archer Shoal
 Chesterman Reef
 Chinaman Reef
 Dicks Reef
 Gater Reef
 Hackie Reef
 Half Moon Reef
 Herald No.1 Reef
 Hixson Cay Reef
 Hook Reef
 Horseshoe Reef
 Howard Patch Reef
 Junior Reef
 Sanctuary Reef
 Sandshoe Reef
 Sinker Reef
 South Hixson Cay Reef
 Sunray Reef
 Sweetlip Reef
 Taiwan Reef
 Twins Reef
 Wilson Reef

Box 56 23001 - 23083

Conical Rocks Reef
 Corroboree Island Reef
 Creek Rock Reef
 Divided Island Reef
 Girt Island Reef
 Great Keppel Island Reef A
 Great Keppel Island Reef B
 Great Keppel Island Reef C
 Great Keppel Island Reef D
 Great Keppel Island Reef E
 Halfway Island Reef
 Humpy Island Reef
 Man & Wife Rocks Reef
 Miall Island Reef
 Middle Island Reef
 Mother Macgregor Island Reef
 North Keppel Island Reef A
 North Keppel Island Reef B
 Outer Rock Reef
 Peak Island Reef
 Pelican Island Reef
 Pumpkin Island Reef

Round Rock Reef
Square Rocks Reef
Sykes Rock Reef
Wedge Island Reef

Box 57 23031 - 24003

Barren Island Reef
Bass Shoals
Brew Shoal
Broomfield Reef
Bushy Islet Reef
Curtis Island Reef A
Curtis Island Reef B
Curtis Island Reef C
Curtis Island Reef D
Curtis Rock Reef
Douglas Shoal
East Bank
Egg Rock Reef
Erskine Island Reef
Facing Is. Reef (North Point)
Facing Is. Reef (Pearl Ledge)
Facing Is. Reef (East Pt. Ledge)
Facing Island Reef B
Facing Island Reef D
Facing Island Reef F
Farmers Reef
Guthrie Shoal
Haberfield Shoal
Heron Island Reef
Innamincka Shoal
Irving Reef
Jabiru Shoals
Johnson Patch
Lisa Jane Shoals
Manning Reef
Masthead Island Reef
North Reef A
North Reef B
North West Island Reef
Polmaise Reef
Rat Island Reef
Rock Cod Shoal
Rundle Island Reef
Sable Chief Rocks Reef
Seal Rocks Reef A
Seal Rocks Reef B
Seal Rocks Reef C
Timandra Bank
Tryon Island Reef
Turtle Island Reef
Wilson Island Reef

Wistari Reef
Wreck Island Reef

Box 58 23052 - 23082

oult Reef
Fairfax Islands Reef
Fitzroy Reef
Heron Island Reef
Hoskyn Islands Reef
Lady Musgrave Island Reef
Lamont Reef
Llwellyn Reef
One Tree Island Reef
Sykes Reef

Box 60 24003 - 24006

Red Rocks Reef

Box 61 24008 - 24009

Herald Patches A
Herald Patches B
Herald Patches C
Lady Elliot Island Reef

Box 62 24010 - 24011

APPENDIX B: LIST OF NAMED REEFS - ALPHABETICAL ORDER

Listed below are all *named* reefs in the GBR in alphabetical order and the 1° latitude / 1° longitude box within which each reef is located (see Map 2). Where different reefs have the same name, each reef's unique identification number is provided. Note that some reefs are located within more than one box.

REEF NAME	BOX	REEF NAME	BOX
Abbott Reef	36	Ballerina Shoal	12
Abrahams Reef	53	Bamborough Island Reef A	46
Acheron Island Reef	28	Bamborough Island Reef B	46
Ada Bank	19	Banana Cay	48
Adelaide Reef	24	Bannan Reef	9
Adroit Shoal	47	Barcoo Bank	52
Agincourt Reef D	21	Barnett Patches	28
Agincourt Reef No.1	21	Baron Reef	16
Agincourt Reef No.2	21	Barren Island Reef	57
Agincourt Reef No.4	19	Barren Islet Reef	50
Agincourt Reefs No.3	19, 21	Barrow Islands Reef	16
Alarm Reef	46	Bass Shoals	57
Albany Island Reef A	1	Basslet Reef	2
Albany Island Reef B	1	Batt Reef	21
Albany Island Reef C	1	Bax Reef	41
Alert Bank	39	Baxendell Shoal	40
Alexandra Reef	21, 45	Beabey Patches	15
Allen Reef	9	Beacon Reef	48
Alpha Rock Reef	1	Beatrice Reef	16
Andersen Reef	19	Beaver Reef	24
Andrew Reef	9	Beaver Shoal	45
Anzac Reef	29	Bee Reef	19
Ape Reef	9	Beesley-Baird Islets Reef	9
Aquila Island Reef	45	Bell Bank	12
Arab Reef	29	Bell Bank	12
Arc Reef	29	Bell Cay Reef	47
Archer Shoal	53	Bellows Island Reef	40
Ariel Bank	1	Ben Reef	36, 41
Arlington Reef	21, 22	Bennett Rock	39
Armit Islets Reef	39	Beor Reef	19
Arnold Islet Reef	5	Beware Rocks Reef	45
Arthur Patches	24	Bewick Island Reef	16
Ashmore Banks (11233)	6	Big Broadhurst Reef A	29
Ashmore Banks (11234)	6	Big Broadhurst Reef B	29
Ashmore Banks (11237)	6	Big Stevens Reef	41
Atkinson Reef	16	Bills Reef	48
Avoid Island Reef	45	Binstead Island Reef	12
Aylen Patch	16	Bird Islands Reef	6
Aylings Reef	2	Black Current Island Reef	39
Baines Patches	22	Black Island Reef	39
Bait Reef	35	Black Reef East	35

<i>REEF NAME</i>	<i>BOX</i>
Black Reef	35
Blackbird Patches	19
Blackcombe Island Reef	40
Blackwood Island Reef	16
Blanchard Reef	12
Bligh Reef	9
Blind Rock Reef	51
Blossom Bank	36
Blu-Lion Reef	48
Bolton Shoal	40
Bond Reef	36
Boomerang Shoal	45
Border Island Reef A	40
Border Island Reef B	40
Border Island Reef C	40
Boulder Reef	19
Boulder Rock Reef	16
Boult Reef	58
Boulton Reef	41
Bow Reef	12
Bowden Reef	33
Bowl Reef	29
Boydong Island Reef	6
Boyle Reef	50
Bramble Reef	28
Brampton Island Reef	40
Bremner Shoal	6
Brew Shoal	57
Brewis Island Reef	1
Brierly Reef	6
Biggs Reef (16074)	22
Briggs Reef (20299)	41
Brisk Islands Reef	28
Britomart Reef	28
Brook Islands Reef	28
Brook Shoal	28
Brooks Shoal	50
Broomfield Reef	57
Broomfield Rock Reef	16
Bugatti Reef	41
Bullion Rocks Reef	40
Bunker Reef	9
Burke Reef	9
Burkitt Island Reef	12
Bushy Island Reef	5
Bushy Islet Reef	57
Cairncross Islets Reef	5
Cairns Reef	19
Cameron Shoal	15
Camp Islet Reef	33
Cannan Reef	41

<i>REEF NAME</i>	<i>BOX</i>
Cape Grenville Reef A	6
Cape Grenville Reef B	6
Cape Grenville Reef C	6
Cape Rock Reef	16
Carlisle Island Reef	40
Carondelet Rock Reef	40
Carpet Snake Island Reef	39
Carter Reef	17
Cashell Rock Reef	40
Castor Reef	34
Cat Reef	9, 12
Cave Island Reef	39
Cayley Reef	24
Celebration Reef	12
Centenary Cay Reef	48
Centipede Reef	29
Central Reef	48
Channel Islet Reef	45
Channel Reef	22
Channel Rocks Reef	16
Chapman Island Reef	9
Charity Reef	34
Chauvel Reef A	41
Chauvel Reef B	41
Chesterman Reef	53
Chicken Reef	29
Chimmo Shoal	6
Chinaman Reef	48, 53
Chinamen Reef (16024)	21
Cholmondeley Islet Reef	6
Christmas Reef	6
Chrome Rock Reef	40
Chyebassa Shoal	39
Cid Island Reef	39
Clack Reef	16
Clara Group Reef	51
Clark Shoal	15
Clerke Island Reef	6
Cliff Islands Reef	15
Cliff Islands Reef	15
Coal Island Reef	50
Coates Reef	24
Cobham Reef A	34
Cobham Reef B	34
Cockatoo Reef	41, 42
Cockburn Patch	6
Cockburn Reef	6
Cockermouth Island Reef	40
Cockle Bay Reef	32
Coil Reef	29
Colclough Reef	12

<i>REEF NAME</i>	<i>BOX</i>
Cole Island Reef	40
Cole Reef A	41
Cole Reef B	41
Collette Reef	6
Collins Island Reef	51
Combe Reef	16
Comston Island Reef	40
Condor Shoal	39
Conical Rock Reef	19
Conical Rocks Reef	56
Connor Islet Reef	45
Connor Rock Reef	51
Coombe Island Reef	28
Coppersmith Rock Reef	40
Coquet Island Reef	16
Coral Point Reef	45
Corbett Reef	13, 16
Corroboree Island Reef	56
Covered Reef	17
Cow Island Reef	39
Cowlishaw Reef	19
Crab Reef	35
Creal Reef	41
Credlin Reefs (20287)	40
Credlin Reefs (20288)	40
Creech Reef A	13
Creech Reef B	13
Creek Rock Reef	56
Crescent Reef	17
Croaker Rock Reef	39
Crompton Shoal	17
Croton Reef	34
Cullen Islet Reef	45
Cup Reef A	29
Cup Reef B	29
Curacao Island Reef A	28
Curacao Island Reef B	28
Curd Reef	9
Curlew Island Reef	45
Curtis Island Reef A	57
Curtis Island Reef B	57
Curtis Island Reef C	57
Curtis Island Reef D	57
Curtis Rock Reef	57
Danger Island Reef	51
Daniell Reef	9
Darley Reef	34
Dart Shoal	12
Davie Reef	13
Davies Reef	29
Davy Patches A	16

<i>REEF NAME</i>	<i>BOX</i>
Davy Patches B	16
Davy Patches C	16
Dawson Reef	19
Day Reef	17
Decapolis Reef	17
Defiance Reefs	39
Delius Patch	19
Deloraine Island Reef	40
Denham Island Reef	16
Dent Island Reef	39
Derry Reef	12
Detour Reef	48
Diamond Reign Reefs	12
Dicks Reef	53
Dingo Reef A	34
Dingo Reef B	34
Dingo Reef C	34
Dingo Reef D	34
Dingo Reef E	34
Dingo Reef F	34
Dip Reef	29
Divided Island Reef	56
Dolphin Reef	9
Donovan Shoal	51
Double Cone Island Reef	39
Double Island Reef	21
Douglas Islet Reef	5, 6
Douglas Islet Reef	45
Douglas Shoal	57
Downward Patches	45
Drake Shoals	12
Draper Patch	19
Drumfish Shoal	45
Dumbell Island Reef	40
Duncan Reef	28
Dunk Island Reef	24
Eagle Reef	30
Earl Banks	51
East Bank	57
East Cay Reef	48
East Hope Island Reef	19
East Spur Reef	46
Eclipse Island Reef	28
Eddy Reef	24
Eden Reef	15
Edgell Bank	52
Edgell Reefs	40
Edward Shoals	9
Edwards Shoal	45
Eel Reef	9
Egg Rock Reef	57

<i>REEF NAME</i>	<i>BOX</i>
Egg Rock Reef	57
Egmont Reef	21
Egret Reef	19
Elford Reef	22
Elizabeth Reef	35
Ellen Reef	35
Ellis Reef	12
Ellison Reef	24
Elusive Reef	48
Emily Reef	19
Emperor Reef	48
Endeavour Reef	19
Erlangen Patch	6
Erskine Island Reef	57
Es Reef	12
Escape Cay Reef	45, 50
Escape Reef	19
Eshelby Island Reef	39
Esk Island Reef	28
Ethel Sand Reef	45
Eulalie Reef	35
Euston Reef	22
Eva Island Reef	28
Evening Reef	19
Eves Reef	13
Exit Reef	9
Eye Reef	17
Eyrie Reef	17
Facing Is. Reef (North Point)	57
Facing Is. Reef (Pearl Ledge)	57
Facing Is. Reef (East Pt. Ledge)	57
Facing Island Reef B	57
Facing Island Reef D	57
Facing Island Reef F	57
Fahey Reef	15
Fairey Reef A	34
Fairey Reef B	34
Fairey Reef C	34
Fairfax Islands Reef	58
Fairfax Rock Reef	45
Faith Reef	34
Fanning Shoal	45
Fantome Island Reef	28
Fantome Rocks Reef	40
Faraday Reef	29
Farmers Reef	57
Farquarson Reef A	24
Farquarson Reef B	24
Feather Reef	24
Ferdinand Shoal	45
Ferguson Reef	9

<i>REEF NAME</i>	<i>BOX</i>
Ferris Shoal	36
Festing Shoal	45
Fife Island Reef	12
Filmoy Shoal	40
Fin Reef	22
First Small Reef	9
Fish Reef	39
Fison Reefs	9
Fitzroy Island Reef	21
Fitzroy Reef	58
Five Reefs	6
Flat Top Island Reef	45
Flinders Island Reef A	16
Flinders Island Reef B	16
Flinders Island Reef C	16
Flinders Rock	16
Flora Reef	24
Fly Island Reef	28
Fly Reef	17
Flynn Reef	22
Foller Reef	48
Forbes Islands Reef	9
Forge Rocks Reef	40
Fork Reef	29
Forrester Reef	19
Forty Winks Reef	6
Forwood Reef	6
Four Fathom Patches	1
Four Reef	6
Franklin Reef	12
Frederick Patches	9
Frenchman Reef	12
Freshwater Point Reef	45
Frigate Cay Reef	48
Gable Reef A	41
Gable Reef B	41
Gallon Reef	9
Gannett Cay Reef	48
Garden Island Reef	28
Gargoyle Reef	35
Garioch Reef	21
Gater Reef	53
George Island Reef	45
Geranium Shoal	40
Gertrude Reef	12
Gibson Reef	24
Gilbey Reef	24
Gill Patches	19
Gilmore Bank	5
Girt Island Reef	56
Glendaver Point Reef	45

<i>REEF NAME</i>	<i>BOX</i>
Glennie Reef	12
Gloucester Island Reef	39
Glow Reef	29
Goldsmith Island Reef A	40
Goldsmith Island Reef B	40
Goldsmith Island Reef C	40
Goldsmith Island Reef D	40
Goodwin Shoal	52
Goold Island Reef	28
Gore Island Reef	6
Goudge Bank	24
Gould Island Reef	39
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Hardy Reef	35
Harold Island Reef	40
Harrier Reef	19
Harrington Reef	1
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Jupiter Reef	30
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Lowrie Island Reef	12
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Lynx Reef	34
Lytton Reef	12
Macarthur Islands Reef	5
MacDonald Reef	12
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Maclear Island Reef	16
MacLennan Cay Reef	6
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Magnetic Island Reef F	32
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May Reef	9
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McIntyre Reef (20304)	41
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Onyx Reef	22
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Passage Reef	6
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Pelican Island Reef (13107)	12
Pelican Island Reef (23017)	56
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Pelorus Island Reef	28
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Pethebridge Islets Reef A	17
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Pickard Reef	9
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Pilot Reef	50
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Pipon Islands Reef	16
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Pirie Islet Reef	5
Pith Reef	29
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Pollux Reef	34
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Pompey Reef	41
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Poynter Island Reef	45
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Rothbury Island Reef	51
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Sherrard Island Reef	9
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Silloth Rocks Reef	40
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South Barren Islet Reef	50
South Bird Islands Reef	6
South Brother Rock Reef	1
South Direction Island Reef	17
South East Islets Reef	46
South Hixson Cay Reef	53
South Island Reef A	46
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South Ledge Reef	1
South Molle Island Reef	39
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Stagg Patches A	24
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Stanley Island Reef A	16
Stanley Island Reef B	16
Stanley Island Reef C	16
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Stanley Reef	34
Stapleton Islet Reef	16
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Startle Reef	19
Steene Reef	13
Stevens Reef	24
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Stork Reef	12
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Sunk Reef	9
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Tern Island Reef	1
Tern Island Reef	41
Thetford Reef	22
Thimble Shoal	29
Thomas Island Reef	40
Thorpe Island Reef	24
Thread Shoal	29
Three Fathom Patch	39
Three Isles Reef	19
Three Reefs	6
Throne Shoals	12
Thrush Reef	6
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Tinsmith Island Reef	40
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Turtle Group Reef H	17
Turtle Group Reef I	17
Turtle Head Island Reef A	1
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Turtle Island Reef (10340)	1
Turtle Island Reef (22027)	50
Turtle Island Reef (23085)	57
Turtle Reef A	17
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Wedge Island Reef	40
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Weigall Reef A	16
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West Hill Island Reef	45
West Hope Island Reef	19
West Molle Island Reef	39
West Reef	45
West Side Island Reef	50
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Wharton Reef	15
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whitsunday Island Reef D	40
Whitsunday Island Reef E	40
Whitsunday Island Reef F	40
Whitsunday Island Reef G	40
Whitsunday Island Reef H	39
Whitsunday Island Reef I	39
Whitsunday Island Reef J	39
Whitsunday Island Reef K	39
Whitsunday Island Reef L	39
Whitsunday Island Reef M	39
Whitsunday Island Reef N	39
Wigton Island Reef A	40
Wigton Island Reef B	40
Wild Duck Island Reef	45, 50
Wilds Shoal	6
Wilkie Island Reef	12
William Reef	9
William Reef	9
Williams Reef	36
Williams Shoal	45
Williamson Reefs	19

<i>REEF NAME</i>	<i>BOX</i>
Wilsen Shoal	12
Wilson Island Reef	57
Wilson Reef (13129)	13
Wilson Reef (22086)	53
Wilson Shoal	33
Winter Shoal	39
Wishbone Reef	9
Wistari Reef	57
Wizard Reef	5, 6
Wooden Patch	16
Wreck Island Reef	57
Wreck Reef	6
Wup Reef	41
Wyatt Earp Reef	36
Wyborn Reef	1
Wye Reef	9
Yamacutta Reef	24
Yankee Reef	29
Yaralla Shoal	45
Yonge Reef	17
Young Reef	9
Yule Detached Reef	6, 7
Yule Reef	21
Zenith Reef	9
Zodiac Cay Reef	48

**APPENDIX C: LIST OF NAMED CYCLONES WITHIN 100 KM OF THE
GBR REGION, FROM 1968-1969 TO 1996-1997**

1968-1969		1977-1978		1986-1987	
Bridget	(Jan)	Hal	(Apr)	Jason	(Feb)
		Gwen	(Feb)		
1969-1970		1978-1979		1987-1988	
Ada	(Jan)	Gordon	(Jan)	Charlie	(Feb)
Cindy	(Mar)	Greta	(Jan)		
Dawn	(Feb)	Kerry	(Feb/Mar)	1988-1989	
1970-1971		Peter	(Dec/Jan)	Aivu	(Mar/Apr)
Dora	(Feb)	Rosa	(Feb)	Delilah	(Dec/Jan)
Fiona	(Feb)	Stan	(Apr)	Meena	(May)
Gertie	(Feb)				
Lena	(Mar)	1979-1980		1989-1990	
1971-1972		Paul	(Jan)	Ivor	(Mar)
Althea	(Dec)	Ruth	(Feb)	Felicity	(Dec)
Bronwyn	(Jan)	Simon	(Feb)	Hilda	(Mar)
Daisy	(Feb)			Nancy	(Jan/Feb)
Emily	(Mar)	1980-1981		1990-1991	
Faith	(Apr)	Cliff	(Feb)	Joy	(Dec)
		Eddie	(Feb)	Kelvin	(Feb)
1972-1973		Freda	(Feb)		
Kirsty	(Feb)	1981-1982		1991-1992	
Leah	(Feb)	Dominic	(Apr)	Fran	(Mar)
Madge	(Mar)			Mark	(Jan)
1973-1974		1982-1983		1992-1993	
Alice	(Mar)	Des	(Jan)	Nina	(Dec/Jan)
Una	(Dec)	Elinor	(Feb)	Oliver	(Feb)
Vera	(Jan)			Roger	(Mar)
Wanda	(Jan)	1983-1984		1993-1994	
Yvonne	(Feb)	Grace	(Jan)	Rewa	(Dec/Jan)
Zoe	(Mar)	Ingrid	(Feb)		
1974-1975		Jim	(Mar)	1994-1995	
Gloria	(Jan)	Kathy	(Mar)	-	
		Lance	(Apr)		
1975-1976		1984-1985		1995-1996	
Alan	(Jan/Feb)	Monica	(Dec)	Celeste	(Jan)
Beth	(Feb)	Nigel	(Jan)	Dennis	(Feb)
David	(Jan)	Odette	(Jan)	Ethel	(Mar)
Dawn	(Mar)	Pierre	(Feb)		
Watorea	(Apr)	Rebecca	(Feb)	1996-1997	
		Tanya	(Mar)	Gillian	(Feb)
1976-1977		1985-1986		Ita	(Feb)
Keith	(Jan)	Manu	(Apr)	Justin	(Mar)
Nancy	(Feb)	Vernon	(Jan)		
Otto	(Mar)	Winifred	(Jan)		

**APPENDIX D: LIST OF NAMED CYCLONES WITHIN 100 KM OF THE
GBR REGION, FROM 1968-1969 TO 1996-1997 BY MONTH**

November

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December

Althea, 1971
Una, 1973
Peter, 1978
Monica, 1984
Delilah, 1988
Felicity, 1989
Joy, 1990
Nina, 1992
Rewa, 1993

January

Bridget, 1969
Bronwyn, 1972
Vera, 1974
Wanda, 1974
Gloria, 1975
Alan, 1976
David, 1976
Keith, 1977
Gordon, 1978
Greta, 1978
Peter, 1978
Paul, 1980
Des, 1983
Grace, 1984
Nigel, 1985
Odette, 1985
Vernon, 1986
Winifred, 1986
Delilah, 1989
Nancy, 1990
Mark, 1992
Nina, 1993
Rewa, 1994
Celeste, 1996

February

Dawn, 1970

Dora, 1971
Fiona, 1971
Gertie, 1971
Daisy, 1972
Leah, 1972
Yvonne, 1974
Alan, 1976
Beth, 1976
Nancy, 1977
Gwen, 1978
Kerry, 1979
Rosa, 1979
Ruth, 1980
Simon, 1980
Cliff, 1981
Eddie, 1981
Freda, 1981
Elinor, 1983
Ingrid, 1984
Pierre, 1985
Rebecca, 1985
Jason, 1987
Charlie, 1988
Nancy, 1990
Kelvin, 1991
Oliver, 1993
Dennis, 1996
Gillian, 1997
Ita, 1997

March

Cindy, 1970
Lena, 1971
Emily, 1972
Madge, 1973
Alice, 1974
Zoe, 1974
Dawn, 1976
Otto, 1976
Kerry, 1976
Jim, 1984
Kathy, 1984
Tanya, 1985
Aivu, 1989

Ivor, 1990
Hilda, 1990
Fran, 1992
Roger, 1993
Ethel, 1996
Justin, 1997

April

Faith, 1972
Watorea, 1976
Hal, 1978
Stan, 1979
Dominic, 1982
Lance, 1984
Manu, 1986
Aivu, 1989

May

Meena, 1989

June

-

July

-

August

-

September

-

October

-