Atlantic States Marine Fisheries Commission

Tautog Management Board

October 22, 2012
11:30 a.m. - 12:30 p.m.
Philadelphia, Pennsylvania

Draft Agenda

The times listed are approximate; the order in which these items will be taken is subject to change; other items may be added as necessary.

1.	Welcome/Call to Order *(B. Goldsborough)*	11:30 a.m.
2.	Board Consent • Approval of Agenda • Approval of Proceedings from February 2012	11:30 a.m.
3.	Public Comment	11:35 a.m.
4.	Overview of State Implementation of Addendum VI	11:45 a.m.
5.	Discussion of federal waters tautog harvest (*T. Kerns*)	11:50 p.m.
6.	Report on Tautog Aging Workshop (*K. Drew)*	12:05 p.m.
7.	Report on Tautog Assessment Scoping Workshop (*P. Caruso*)	12:20 p.m.
8.	Other Business/Adjourn	12:30 p.m.

The meeting will be held at the Radisson Plaza-Warwick Hotel, 220 South 17th Street, Philadelphia, PA 215.735.6000

MEETING OVERVIEW

Tautog Management Board
Monday, October 22, 2012
11:30 a.m. – 12:30 p.m.
Philadelphia, Pennsylvania

Chair: Bill Goldsborough (MD) Assumed Chairmanship: 03/11	Technical Committee Chair: Paul Caruso (MA)	Law Enforcement Committee Representative: Blanchard
Vice Chair: Jim Gilmore (NY)	Advisory Panel Chair: Pat Donnelly	Previous Board Meeting: February 8, 2012
Voting Members: MA, RI, CT, NY, NJ, DE, MD, VA, NC, NMFS, USFWS (11 votes)		

2. Board Consent

- Approval of Agenda
- Approval of Proceeding from February 8, 2012

3. Public Comment – At the beginning of the meeting public comment will be taken on items not on the Agenda. Individuals that wish to speak at this time must sign at the beginning of the meeting. For agenda items that have already gone out for public hearing and/or have had a public comment period that has closed, the Board Chair may determine that additional public comment will not provide additional information. In this circumstance the Chair will not allow additional public comment on an issue. For agenda items that the public has not had a chance to provide input, the Board Chair may allow limited opportunity for comment. The Board Chair has the discretion to limit the number of speakers and/or the length of each comment.

4. Overview of State implementation of Addendum VI (11:45-11-50 a.m.)
Background • States were required to implement measures to comply with the Addendum VI Ftarget = 0.15 by January 1, 2012. • The Board has approved reduction methodologies for all states. • New Jersey's requested a change in the fall/winter season to account for a delay in state administrative delay in implementation of the measures for 2012. • The board approved the New Jersey request via an email vote
Presentations • Update on approved state regulations for 2012 and 2013 by T. Kerns
Board actions for consideration • None

5. Discussion of federal waters tautog harvest (11:50 a.m. -12:05 p.m.)
Background • Regulatory measures for tautog only exist in state waters. • New York has seen an increase in federal water commercial harvest from recreational fishermen using a coastal landing permit

Presentations

- Review of New York harvest and permit system by T. Kerns (**Supplemental Materials)**

Board actions for consideration

- Recommendations for Federal Waters

6. Report on Tautog Aging Workshop (12:05-12:20 p.m.)

Background

- Virginia's age-length data was excluded from the 2005 benchmark and 2011 Assessment Update because the data indicated a jump in mean length-at-age in all age groups, ageing methodology had changed, and these discrepancies could not be resolved in time for the assessment.
- To reconcile the differences, the Tautog TC initiated a hard part (otolith and operculum) exchange and conducted a two-day aging workshop in May 2012
- The results indicated that VA's data were not biased in comparison to other states.

Presentations

- Report on tautog aging workshop highlights by K. Drew (**Briefing CD)**

7. Report on Tautog Assessment Scoping Workshop (12:20 – 12:30 p.m.)

Background

- A benchmark assessment is scheduled for 2014
- The TC and SASC convened a workshop to review the recommendations of the previous peer review and discuss alternative assessment approaches to improve the quality of the assessment

Presentations

- Report on workshop highlights by P. Caruso (**Briefing CD**)

8. Other Business/Adjourn

DRAFT **DRAFT** **DRAFT**

DRAFT PROCEEDINGS OF THE

ATLANTIC STATES MARINE FISHERIES COMMISSION

TAUTOG MANAGEMENT BOARD

Crowne Plaza Hotel - Old Town
Alexandria, Virginia
February 8, 2012

These minutes are draft and subject to approval by the Tautog Management Board. The Board will review the minutes during its next meeting.

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INDEX OF MOTIONS

ATTENDANCE

Board Members

David Pierce, MA, proxy for P. Diodati, (AA)
William Adler, MA (GA)
Jocelyn Cary, MA, proxy for Rep. Peake (LA)
Mark Gibson, RI, proxy for R. Ballou (AA)
William McElroy, RI (GA)
Rick Bellavance, RI, proxy for Rep. Martin (LA)
Dave Simpson, CT (AA)
Lance Stewart, CT (GA)
Rep. Craig Miner, CT (LA)
James Gilmore, NY (AA)
Pat Augustine, NY (GA)
Brian Culhane, NY, proxy for Sen. Johnson (LA)
Peter Himchak, NJ, proxy for D. Chanda (AC)
Tom Fote, NJ (GA)
Adam Nowalsky, NJ, proxy for Asm. Albano (LA)
Bernie Pankowski, DE, proxy for Sen. Venables(LA)
Jeff Tinsman, DR, proxy for D. Saveikis (AA)
Roy Miller, DE (GA)
Tom O'Connell, MD (AA)
Bill Goldsborough, MD (GA)
Jack Travelstead, VA, proxy for S. Bowman (AA)
Catherine Davenport, VA (GA)
Jaime Geiger, USFWS

(AA = Administrative Appointee; GA = Governor Appointee; LA = Legislative Appointee)

Ex-Officio Members

Jason McNamee, Technical Committee

Staff

Vince O'Shea
Bob Beal
Chris Vonderweidt
Mike Waine

Guests

The Tautog Management Board of the Atlantic States Marine Fisheries Commission convened in the Presidential Ballroom of the Crowne Plaza Hotel, Alexandria, Virginia, February 8, 2012, and was called to order at 5:45 o'clock p.m. by Chairman William Goldsborough.

CALL TO ORDER

CHAIRMAN WILLIAM GOLDSBOROUGH: Good evening, everybody. This is the Tautog Management Board. I'm Bill Goldsborough, the chairman. I know it's late but we have a pretty straightforward agenda, so hopefully we can get through it pretty quickly.

APPROVAL OF AGENDA

As the first order of business, does anybody have any changes to the agenda? Seeing none, the agenda is approved.

APPROVAL OF PROCEEDINGS

Does anybody have any changes to the proceedings from the November 8th meeting? Seeing none, the proceedings from November are approved. At this time we'll take public comment on items not on the agenda. Is there anybody that would like to offer public to the board? Seeing none, we'll move along to Agenda Item 4, the primary agenda item, the review of the state implementation of Addendum VI, and I'll pass it to Chris for an update on approved state regulations.

REVIEW OF STATE IMPLEMENTATION OF ADDENDUM VI

UPDATE ON APPROVED STATE REGULATIONS

MR. CHRISTOPHER VONDERWEIDT: I'm just going to kind of go through where states are implementing their regulations for Addendum VI and then I'm going to pass it over to Jason McNamee from Rhode Island who is sitting in as the Technical Committee Chair for this meeting, and he is going to talk about the New Jersey proposal.

Just as a quick refresher, Addendum VI established an F target equal to 0.15 to rebuild the stock, which when converted equals a 53 percent harvest reduction based on the average of 2008 and 2009. It also carried over language from previous addendums allowing for state/regional assessments that are at the same level of precision as the coast-wide assessment.

As part of that, the states are required to give an annual update as part of their compliance report. It had an implementation date of January 1, 2012. At previous board meetings there was a regional virtual population assessment submitted by Massachusetts/Rhode Island where they demonstrated an F rate lower than the coast-wide average of 0.12 and the coast-wide average was – excuse me, lower than the F target of 0.15. Their assessment was 0.12.

Their precision metric was 0.69 versus 0.61 for the coastwide so it was deemed at the same level of precision. The TC also commented that these states showed a history of proactive management so it seemed like something that would be fine to approve. The board accepted the technical committee's recommendations and Massachusetts/Rhode Island are not required to implement any new regulations as part of Addendum VI.

Moving forward to states that did have to submit regulations to meet the target, states weren't quite sure at that time what suite of regulations their fishermen were going to prefer, so what they opted to do was to submit a variety of proposals based on specific reduction methodology, reduce seasons, increase size limits, reduce bag limits; a combination but they laid out the equations and the methods that they would use to do that.

The technical reviewed those specific methods. There were a number of rounds of that and the technical committee guidance, and the technical committee gave some caveats with those recommendations; things like you couldn't have a half-inch size increase, you couldn't have a seven-day standalone season reduction, something in the middle. It would have to be two weeks or greater.

States agreed with that and so did the board. As far as state/regional assessments for states other than Massachusetts and Rhode Island, the board approved a catch curve methodology based on recommendations of the technical committee. There were three caveats with those. New York would need a 48.7 percent reduction rather than the 53 percent.

At that time New Jersey was approved to use catch curve methodology; however, it was unknown what level of reduction would be necessary. New Jersey did not go that route. Maryland was 49 percent and Virginia was 50.5 percent. That's where we were at during the last board meetings.

Since then all states submitted proposals explaining what methodology was used to achieve the regulations in their final regulation package or where they were along in the process. Unfortunately there were two proposals that were submitted last week. That's one of the reasons why this stuff was on the supplemental material rather than the briefing materials.

Staff handed out the actual proposals from the states, and then there is sort of a summary table here that has actually been updated from the supplemental material. There were a few inconsistencies between state proposals and the actual regulations, but this table represents what the final state regulations – or the ones that will be final are.

I just want to point out that the plan review team hasn't had a chance to look at this, so it's pretty preliminary at this point. The Law Enforcement Committee also has not had a chance to review it due to the late submissions. I have spoken with Mark about reviewing and looking at what some of the recommendations for federal waters might be based on the state regulations, but it's just preliminary.

All the state proposals appear to comply with the technical committee's previously approved methodology – the board's previously approved methodology except one part of the New Jersey proposal, which Jay will go through. It's a commercial size increase, which the technical committee reviewed, and you can follow along in the memo.

Going from north to south, remember Massachusetts/Rhode Island were not required to implement anything new, so that brings us to Connecticut. They have a 53 percent total reduction. They stayed with a 14-inch size limit. These regulations were effective January 23rd. There is just a new closed season from February 1 through April 30th in both fisheries.

For New York a total of 48.7 percent reduction; there are a few additional closures in the recreational season, January through April, October 1-7, and December 4-20. I'll just point out that the October 1-7, that's not in the middle of an existing season. It is at the end of an existing season, so it follows what the technical committee recommendations were.

They also increased the recreational size limit by two inches. It is now 16 inches. You can look on the table and sort of get a sense for where states are with the size limits if you want, because that's one of the themes that has come up over and over with this as far as enforcement and things like that.

For the commercial in New York, they also implemented a few additional closures, January through February 28th and April 8th through December 31. They increased the size limit by one inch to 15 inches.

For Delaware, a 53 percent reduction was effective February 11th or it will be. They have consistent recreational and commercial regulations for the tautog fishery. What they did was they reduced the bag limit. They had a ten-fish bag limit in three seasons and then there was a three-fish bag limit in the other season so they made all the seasons a bag limit of five fish, so they decrease it by five and three of them increased it by two.

Then in addition it was a 16-day additional Wave 4 closure. They increased the size limit from two 16 inches, and it was 14 in three of the seasons and 15 in one of the seasons, so that was a one-inch size increase for one of the seasons and then it would be a two-inch size increase for those other two seasons.

Maryland used a catch curve methodology to demonstrate an F rate which only needed a 48.8 percent reduction using the catch curve methodology. It's not in place right now. It's expected to be effective April 2, 2012. Maryland DNR staff told me that. They have consistent commercial and recreational regulations.

They went with a 16-inch size limit, which is a two-inch increase, and also implemented an additional 16-day Wave 6 closure. Just one thing to point out with the April 2nd implementation date, the harvest reduction from January 1 through April 1, the increase in size limit won't be realized. I don't know if it's a big deal or not, but they're on schedule to have this implemented soon.

For Virginia, they reduced 50.5 percent using that catch curve approved methodology. Their regulations were effective January 1. The new recreational regulations, they increased their size limit to 16 inches, which is a two-inch increase; decreased the possession limit to three fish, which is a one-fish bag limit reduction; and implemented a 106 day closure in Waves 2 through 4. For their commercial regulations, there is an additional 57-day closure, Wave 1 and Wave 5, and then a commercial increase to 15 inches, which is an increase of one inch.

For New Jersey, like I said before, their harvest reduction methodology was the same as their submitted proposals for the majority of the proposal. It's a 53 percent reduction so the full reduction. These regulations were effective January 25th of this year. They increased the size limit to 15 inches. There are additional closures, March 1 through 31st; July 10 through 16; July 17 through 26; September 10 through October 16.

None of these closures are standalone so they meet the caveats that the TC laid out; four fish November 16 through December 31, so they reduced the bag limit for that season. In the commercial you'll see underlined there is a 15-inch size limit, which Jay is going to talk about, and additional closures of June and November. I'm going to pass it over to Jason to give the technical committee's review of New Jersey's proposals.

NEW JERSEY PROPOSAL

MR. GOLDSBOROUGH: Before you do that, I want to point out to the board that Jason is pinch hitting for Paul Caruso, the TC Chair, who couldn't be here, so thank you, Jason.

MR. JASON McNAMEE: As Chris mentioned, New Jersey had come back after the original approval with an additional idea, and that was to take some of their reduction in their commercial fishery. The New Jersey advisors requested this increase after the November board meeting. The TC met in December of last year to go over this.

The next slide is the methodology that they used. What they did was they applied the recreational size limit data to the commercial fishery. This is a discussion we have a lot with tautog. We used the recreational size distribution from that fishery as a proxy for the commercial fishery because they're not completely dissimilar.

A lot of it is rod and reel and smaller scale fishermen, commercial or recreational. They took that distribution and used the Mid-Atlantic Fishery Management Council's SAS Code. That is a program that the Mid-Atlantic Council has developed that goes into the MRFSS data – it was MRFSS at the time this all occurred – and extracts the information regarding catch and size and then develops a set of reductions that you can get from various iterations of different size and bag limit levels.

It's something that we've used in other fisheries. For instance, summer flounder, black sea bass, scup, we use the same program to develop those reductions and liberalizations. The technical committee was comfortable with the approach. It was also a similar methodology to what was used in New York and Connecticut.

The technical committee had recommended not taking more than a maximum of 44 percent of your reduction from a size limit adjustment alone just to be precautionary and to diversify a little bit where the reduction is coming from, and this would also allow for a 9 percent buffer just to take account of some of the lack of precision in the information that's being used.

Their final regulation package in the end only took 29 percent; so of that 53 percent that ended up putting together for their reduction, only 29 percent of that came from the minimum size change to the commercial fishery. The technical committee recommended that the board approve that. With that, we end up on the last slide and I think that is the only action that we need today to hear from the board. With that, thank you very much.

CHAIRMAN GOLDSBOROUGH: Thank you, Jason. Questions for either Jason or Chris? Seeing none, we need a motion, right? Do I see a motion to approve the New Jersey commercial size increase? Bill Adler.

MR. WILLIAM A. ADLER: **I will so move**.

CHAIRMAN GOLDSBOROUGH: Is there a second; Pat Augustine. Any discussion on the motion? **The motion is move to approve the New Jersey commercial size increase.** Motion by Mr. Adler; second by Mr. Augustine. Pete.

MR. PETER HIMCHAK: Mr. Chairman, I think this motion is straightforward as far as methodology. I would just like to add to that that New Jersey does have a limited entry program on tautog. There are only 64 commercial fishermen allowed to sell tautog in New Jersey; and of those 24 have a non-directed permit which limits them to a hundred pounds per day. It's becoming smaller and smaller. Thank you.

CHAIRMAN GOLDSBOROUGH: Any further discussion? Ready to vote? Any need for a caucus? Seeing no apparent need, all in favor indicate with raising your right hand, please; opposed same sign; any abstentions; null votes. **The motion passes ten to nothing.** Okay, let's move on to Agenda Item 5, update of the tautog aging review.

UPDATE OF THE TAUTOG AGING REVIEW

DR. KATIE DREW: This year we initiated a tautog hard part exchange, so participating states from Massachusetts all the way down through Virginia have each contributed ten opercula samples and also if available ten samples of otoliths from paired fish. They have been sent to the commission and all their identifying information has been stripped off of them.

They are now going up to the states. We just sent the package out to the first lab in Virginia today. Each lab will read the otoliths and opercula and then give me the results. In the end we'll be able to compare and see what the labs are saying about each fish, so comparing how close everybody is to each other and how close the otolith and opercula samples are. This will help us get an idea of how standardized the states are in their aging techniques and maybe give us an idea of how well matched otoliths and opercula bones are for aging tautog.

OTHER BUSINESS

CHAIRMAN GOLDSBOROUGH: Any questions for Katie? Great report! I suppose this moves us on to other business. Do I have any volunteers for other business? Pat.

ADJOURNMENT

MR. PATRICK AUGUSTINE: Move to adjourn.

CHAIRMAN GOLDSBOROUGH: Any objections; we are adjourned.

(Whereupon, the meeting was adjourned at 6:00 o'clock p.m., February 8, 2012.)

Atlantic States Marine Fisheries Commission

Healthy, self-sustaining populations for all Atlantic coast fish species or successful restoration well in progress by the year 2015.

Proceedings of the Tautog Ageing Workshop

May 2012

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Acknowledgements

The Atlantic States Marine Fisheries Commission thanks Old Dominion University's Center for Quantitative Fishery Ecology for preparing the tautog otoliths of the other participating states for the hard part exchange. The Commission also thanks ODU for welcoming workshop participants into their ageing lab for hands-on demonstrations and practice.

The Commission also thanks the individuals who contributed their time and expertise to this project, including Paul Caruso (MA DMF), Joe Cimino (VMRC), James Davies (ODU), Sandra Dumais (NY DEC), Scott Elzey (MA DMF), Garry Glanden (DE DFW), Kurt Gottschall (CT DEEP), Jameson Gregg (VIMS), Hongsheng Liao (ODU), Nick Marzocca (NJ DFW), Anthony Mazzarella (NJ DFW), Scott Newlin (DE DFW), Nicole Travisono (RI DEM DFW), and Angel Willey (MD DNR).

ASMFC also appreciates the efforts of Commission staff Katie Drew and Chris Vonderweidt in coordinating the workshop and exchange and preparing this report.

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1 Introduction

The tautog (*Tautoga onitis*) is a member of the wrasse family found from Nova Scotia to South Carolina. Adults prefer hard-bottom habitats with either natural or man-made structure. Tautog show seasonal inshore-offshore migration patterns but do not appear to undertake extensive north-south migrations.

Tautog support primarily recreational fisheries in New England and the mid-Atlantic. The stock underwent a benchmark assessment in 2005 (ASMFC 2006), which was updated most recently in 2011 (ASMFC 2011). The update indicated tautog were overfished and overfishing was occurring. The assessment used an age-based model, the ADAPT VPA. The coastwide catch-at-age input was developed using regional age-length keys for the north (New York through Massachusetts) and south (North Carolina through New Jersey).

Tautog are aged using opercular bones, following the techniques of Cooper (1967) and Hoestetter and Munroe (1993). The dissected opercular bones are boiled in water for one to two minutes and cleaned of tissue. The bones are allowed to dry for two days and then read, usually with transmitted light, without magnification. Hoestetter and Monroe (1993) validated the annual nature of ring formation in opercula with marginal increment analysis.

Old Dominion University's Center for Quantitative Fishery Ecology, which ages Virginia's fishery-dependent samples, began using otoliths as a reference hard part to standardize their readings of tautog opercula in 2001. Whole otoliths are baked and embedded in epoxy. A low-speed saw is used to cut a thin section (0.4mm) through the core of the otolith. The section is mounted on a slide and read with a microscope. Processing otoliths requires more hands-on time and more sophisticated equipment and supplies than processing opercula.

This difference in technique raised concerns that the Virginia data were not comparable to the age data of the other states. As a result, the benchmark assessment and update did not include the most recent years (2001 – present) of age data from Virginia (ASMFC 2006).

At the request of the Tautog Management Board, the Commission organized a hard part exchange and ageing workshop for tautog. The objectives were to assess the precision of age readings between states and come to a consensus on best ageing practices for tautog to ensure consistency in age assignment going forward.

2 Hard Part Exchange Results

A total of nine labs from eight states participated in the hard part exchange. Each state provided 10 opercula and, if available, the corresponding otoliths from the same fish. States were asked to provide samples that covered the full range of sizes observed in their collections. Total length of sampled fish ranged from 142 mm to 777 mm, with the majority of samples in the 300 – 600 mm range (Figure 1). A total of 82 opercula and 72 otoliths were provided. ODU processed the whole otoliths that were provided by other states.

The samples were anonymized so that participants did not know the state of origin or which otolith matched which operculum. The samples were mailed to each lab in turn. When the labs completed their reads, they submitted them to Commission staff via e-mail and sent the samples to the next lab.

A total average CV was calculated for the operculum samples and for the otolith samples. In addition, the average CV was calculated for the operculum vs. otolith comparisons and the state vs. state comparisons. Bowker's test of symmetry (Evans and Hoenig, 1998) was used to test for systematic bias in the state vs. state and hard part comparisons. Maryland did not submit otolith ages; only operculum age results are presented for that state.

2.1 Operculum vs. Otolith Ages

Only ODU currently reads tautog otoliths. Readers from other states had little to no experience or training reading tautog otoliths. Despite this, the level of precision was similar for both operculum and otoliths. The average CV for the operculum samples was 13.2% across all states. The average CV for the otolith samples was 13.6% across all states.

States' operculum-otolith comparisons showed a range of CVs, from a low of 8% to a high of 18% (Tables and Figures
Table 1, Figures 2-9). None of the states exhibited significant bias, as indicated by Bowker's test of symmetry, indicating that the ages assigned by opercula were not systematically different from ages assigned by otoliths. It should be noted that the sample size of older fish was small, which limits the power of the test to detect a systematic difference at older ages.

2.2 State Comparisons

Between-state comparisons resulted in a range of CVs, from lows of 4.6% (operculum ages) and 3.5% (otolith ages) to highs of 18.3% (operculum ages) and 17.5% (otolith ages) (Tables 2 and 3, Figures 9 – 43). Some states showed significant systematic differences (Bowker's test, $p<0.05$). Massachusetts aged opercula younger than all other labs. ODU aged opercula younger than Maryland at all ages, and aged opercula younger than Rhode Island at younger ages and older than Rhode Island at older ages. New York aged opercula older than New Jersey.

Overall, the CVs of readings between ODU and other states were similar to CVs of other state comparisons, and ODU's readings did not exhibit significant systematic differences from most other states.

The first annulus in tautog opercula can become obscured by additional bone growth in older, larger fish and occasionally must be inferred based on the radius of the first visible annulus. It was suggested that if southern fish grow faster and have a wider first annulus than northern fish, states might show more agreement in readings of fish from their region than fish from the other region. Bias plots and CVs were calculated for operculum ages of northern fish and southern fish (Table 4, Figures 44 – 71). Although some state-state comparisons had lower CVs for one region, there were not large differences between the pooled CVs and the region-specific CVs. In addition, there did not appear to be a geographic pattern in the CVs of state comparisons; that is, CVs were not higher between more distant states.

3 Workshop Recommendations

3.1 Virginia's operculum ages are acceptable for use in the next benchmark assessment.

The CVs in the ODU-state comparisons were similar to the CVs of other state comparisons. There was evidence of systematic differences between ODU and MA, MD, and RI; however, comparisons of other states also showed systematic differences. Thus, workshop participants concluded that Virginia's age data were not different enough from the other states to warrant exclusion, despite the fact that they use a slightly different technique to age tautog opercula.

3.2 Operculum collection should remain the standard for biological sampling of the tautog catch, but paired sub-samples of otoliths should be added.

The exchange did not reveal significant systematic differences between ages assigned by opercula and ages assigned by otoliths. Given the relative ease of processing opercula, the long time-series of operculum ages, and the age of the plus group (12+) used in the stock assessment, there is no immediate need to switch to otoliths as the preferred ageing structure.

Even without training in reading tautog otoliths, the level of precision for otoliths and opercula was similar. This suggests that with more experience, states could get improved precision by using otoliths to age tautog or to provide a reference for difficult-to-read opercula. Workshop participants recommend that states begin collecting paired sub-samples of tautog opercula and otoliths from 50 fish per year evenly spread across the observed size range. This paired collection can serve as a reference tool to help standardize readings and improve precision of age assignments. States that do not have the resources to process and read the otoliths can archive the samples for future work.

3.3 States should calibrate their age readings every year by re-reading a subset of samples from previous years before ageing new samples. States that do not currently assess the precision of their age readings over time should do so by re-ageing a subset of their historical samples.

The results of the hard part exchange provide a snapshot of current rates of precision and bias between states. However, the exchange cannot determine whether that precision or bias has changed over time. Labs should assess the repeatability of their age readings over time by re-ageing a subset of their samples from earlier years. Ideally this should be done before reading the current year's samples as a training exercise to maintain consistency in technique over time.

States that have not consistently assessed their precision over time should re-age a subset of historical samples to help determine whether the results of the exchange are valid for earlier years. Commission staff will coordinate with the states to collect and disseminate the results of this exercise in the winter of 2012/2013. These data will allow the Tautog Technical Committee to evaluate whether there has been consistent bias between states over time and, if so, how best to incorporate historical data into age-length keys for the next benchmark assessment.

In addition to rereading historical samples, Massachusetts is also rereading the exchange samples to determine the cause of the systematic differences between Massachusetts and the other states.

3.4 Regional reference collections of paired operculum and otolith samples should be assembled and regular exchanges should be scheduled to maintain and improve the precision of age readings between states that will be pooled in the regional age-length keys.

Although there is interest in assessing tautog on a regional or even state-specific basis, biological samples will still need to be pooled at some level, and maintaining consistency and precision between labs is important.

States can maintain their own collections of paired otolith and operculum samples, and Commission staff can facilitate annual or biennial exchanges of hard parts.

4 Literature Cited

ASMFC 2006. Tautog Stock Assessment Report for Peer Review. Stock Assessment Report No. 06-02 (Supplement) of the Atlantic States Marine Fisheries Commission. 176 pp.

ASMFC 2011. Tautog Assessment Update Summary. 9 pp.

Cooper, R.A. 1967. Age and growth of the tautog, *Tautoga onitis* (Linnaeus), from Rhode Island. Trans. Am. Fish. Soc. 96: 134-142.

Evans, G.T. and J.M. Hoenig. 1998. Testing and viewing symmetry in contingency tables, with application to readers of fish ages. Biometrics 54 (2): 620-629.

Hostetter, E.B. and T.A. Monroe. 1993. Age, growth, and reproduction of tautog, *Tautoga onitis* (Labridae: Perciformes) from coastal waters of Virginia. Fish. Bull. 91: 45-64.

5 Tables and Figures

Table 1: Precision and bias of otolith-operculum comparisons for each state

		% Agreement		
	Average CV	Absolute	Within 1 year	Bowker's p
ODU	8.1%	45.8%	91.7%	0.32
VIMS	13.1%	34.7%	79.2%	0.40
DE	16.0%	25.0%	68.1%	0.26
NJ	18.0%	23.6%	65.2%	0.31
NY	12.3%	34.7%	68.1%	0.31
CT	7.9%	51.4%	87.5%	0.42
RI	10.8%	35.3%	82.4%	0.69
MA	13.6%	25.0%	83.3%	0.15

Table 2: Average CVs of state vs. state operculum readings.

	ODU	**VIMS**	**MD**	**DE**	**NJ**	**NY**	**CT**	**RI**
ODU								
VIMS	***11.6***							
MD	***8.9***	***13.7***						
DE	9.8	***13.3***	6.7					
NJ	9.5	11.3	9.8	9.6				
NY	13.3	***18.4***	9.3	9.5	***11.3***			
CT	8	***13.6***	4.6	6.6	8.9	9.7		
RI	***10.3***	***11.1***	7.2	6.9	7.2	11	7.5	
MA	***7.5***	8.1	***14.3***	***13.6***	***10.6***	***18.3***	***13.2***	***12.1***

***Red font indicates significant deviation from symmetry (Bowker's p < 0.05)**

Table 3: Average CVs of state vs. state otolith readings.

	ODU	**VIMS**	**DE**	**NJ**	**NY**	**CT**	**RI**
ODU							
VIMS	9.5						
MD							
DE	13.2	14.9					
NJ	14.4	10.2	***17.5***				
NY	3.5	***10.1***	12.2	12.9			
CT	3.7	***11***	14	***14.6***	4.5		
RI	9.7	***12.4***	9.3	***15***	8.8	9.1	
MA	7.2	7.7	***12.7***	10.4	6.9	***9.3***	***10***

***Red font indicates significant deviation from symmetry (Bowker's p < 0.05)**

Table 4: Average CV of state vs. state operculum readings by region of sample origin (Northern fish/southern fish).

	ODU	VIMS	MD	DE	NJ	NY	CT	RI
ODU								
VIMS	12.6/10.5							
MD	7.5 /***10.2***	13.0/14.5						
DE	8.2/11.4	13.6/13.0	6.1/7.5					
NJ	7.9/11.2	8.5/14.3	9.4/10.2	9.0/10.3				
NY	13.1/13.6	18.8/18.0	9.7/8.9	10/8.9	12.7/9.9			
CT	6.4 / 9.6	13.4/13.8	3.6/5.6	5.1/8.2	9.4/8.3	11/8.4		
RI	9.2/11.6	9.9/13.8	8.1/6.4	6.9/6.9	5.0/9.5	11.1/10.9	7.9/7.1	
MA	***6.9***/8.2	9.2/7.0	***12.7/16***	13.1/14.1	8.0/***13.3***	***18.9***/17.7	***12.9/13.6***	11/***13.4***

Red font indicates significant deviation from symmetry (Bowker's p < 0.05)

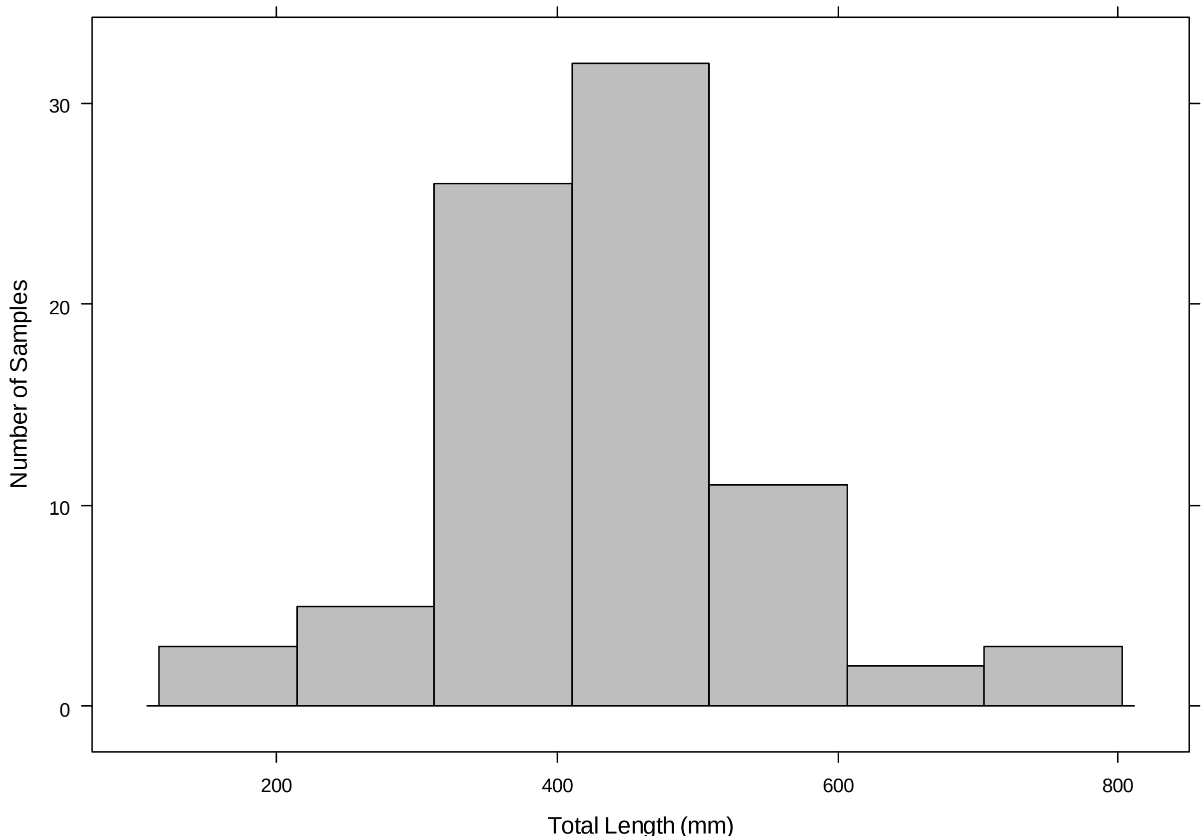


Figure 1: Length frequency distributions of fish included in the hard part exchange.

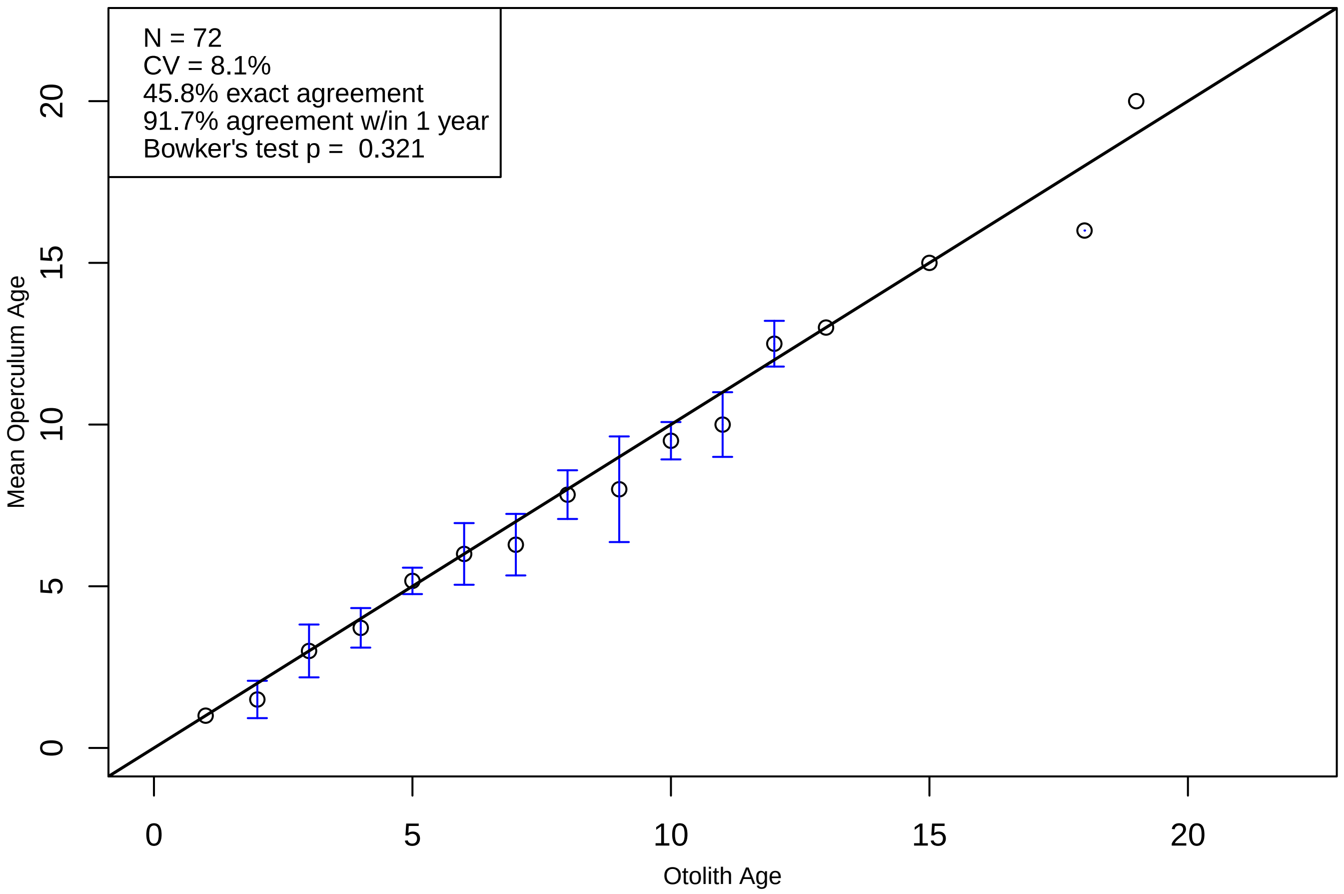


Figure 2: Mean operculum age vs. otolith age for ODU. Error bars = standard deviation.

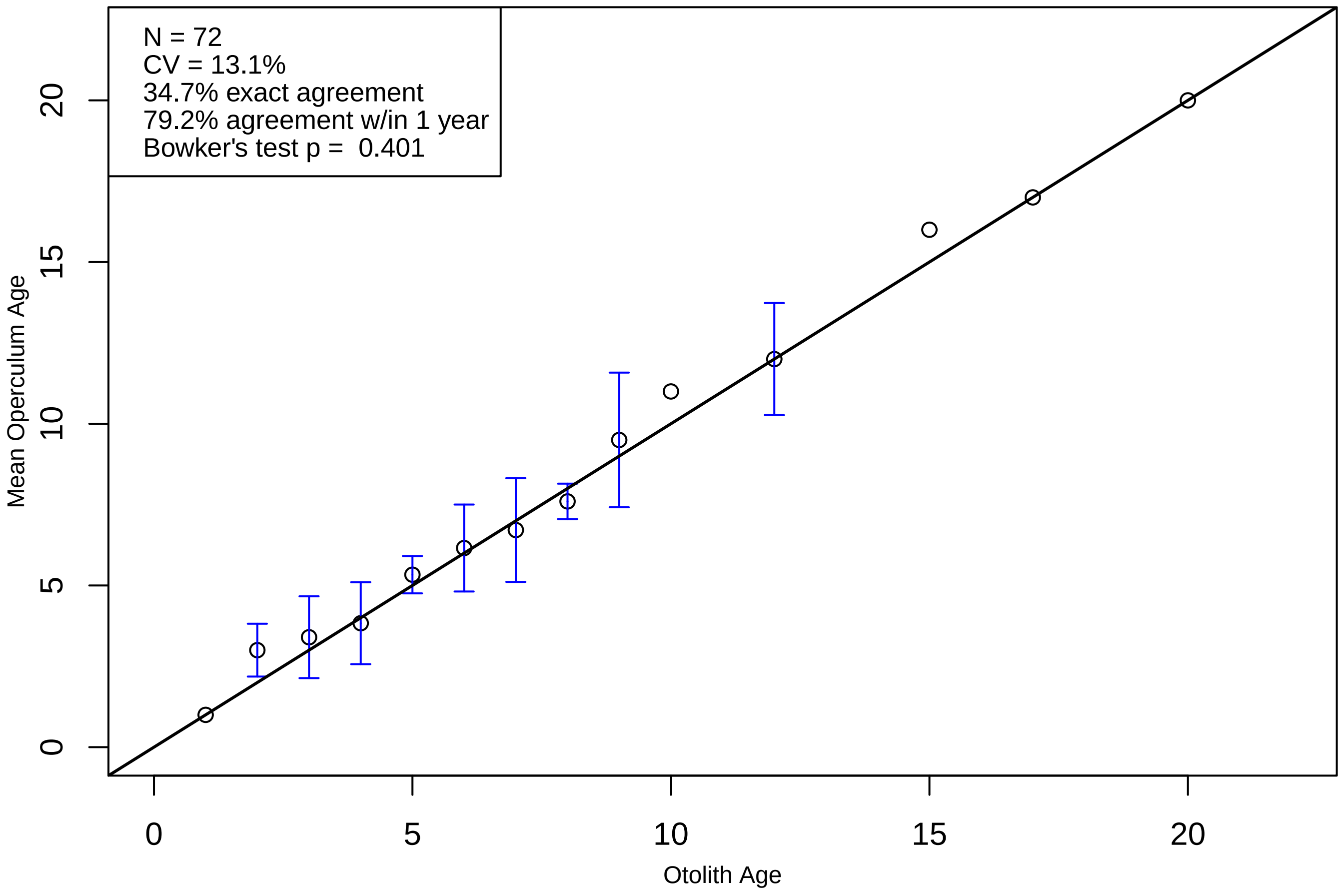


Figure 3: Mean operculum age vs. otolith age for VIMS. Error bars = standard deviation.

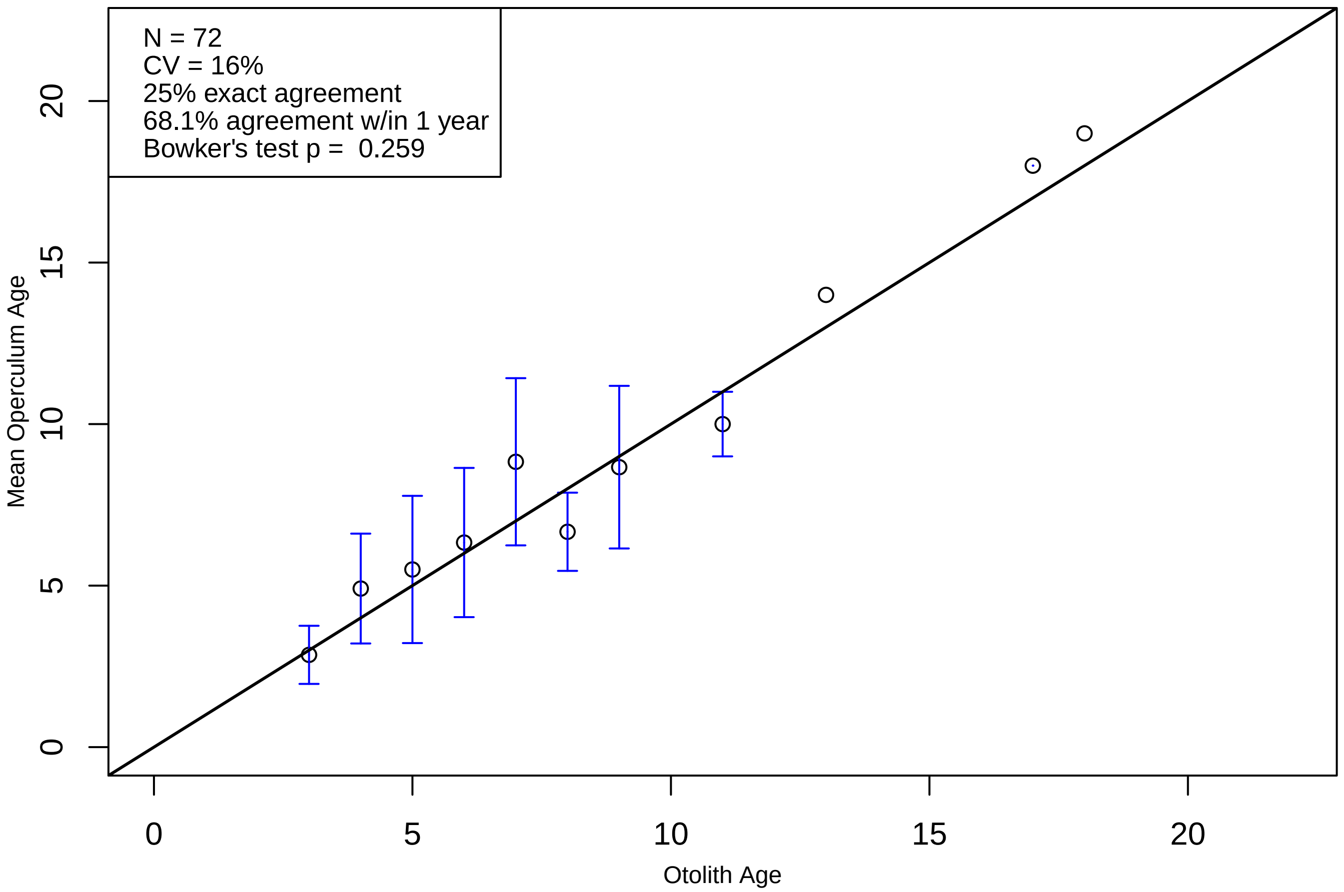


Figure 4: Mean operculum age vs. otolith age for DE. Error bars = standard deviation.

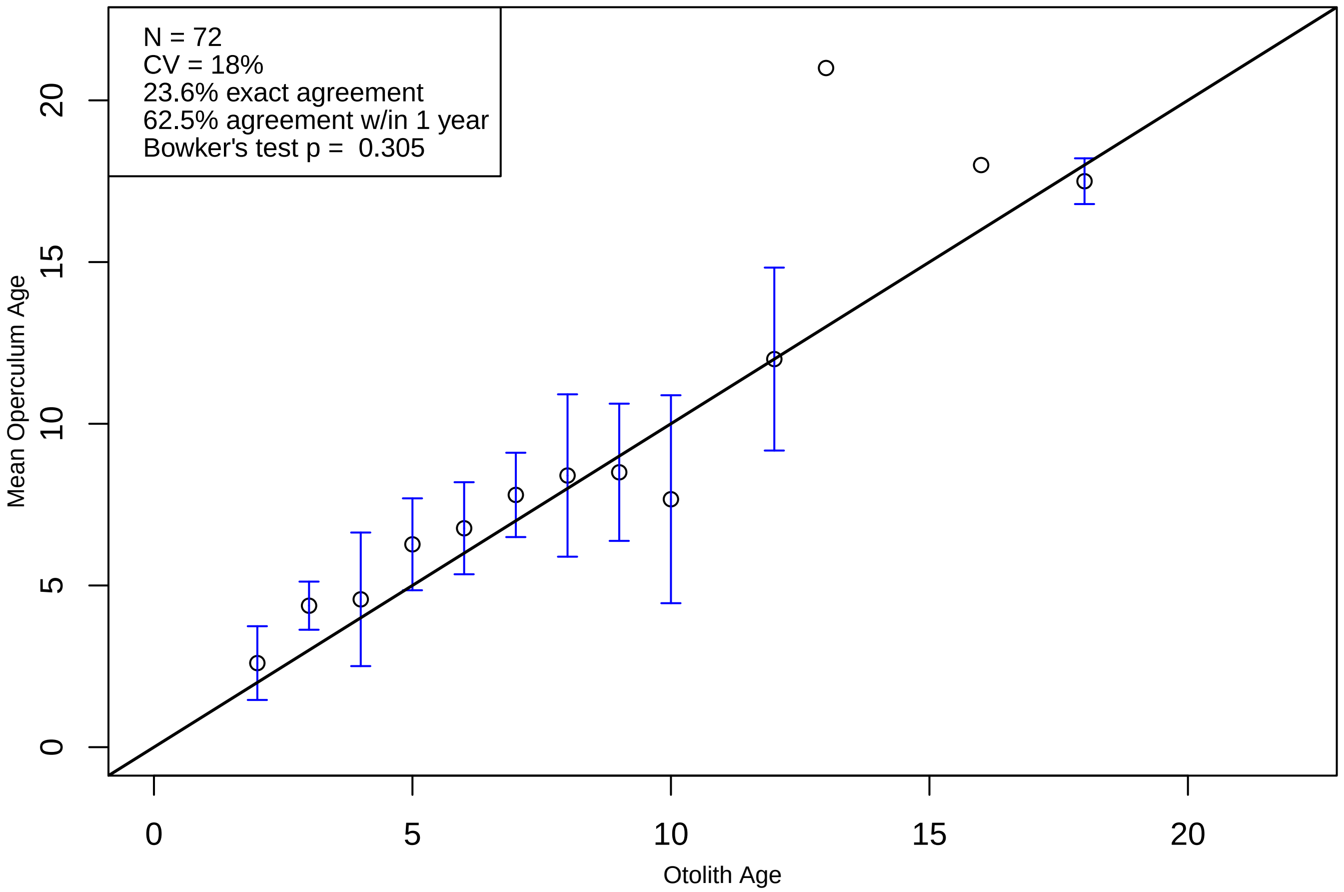


Figure 5: Mean operculum age vs. otolith age for NJ. Error bars = standard deviation.

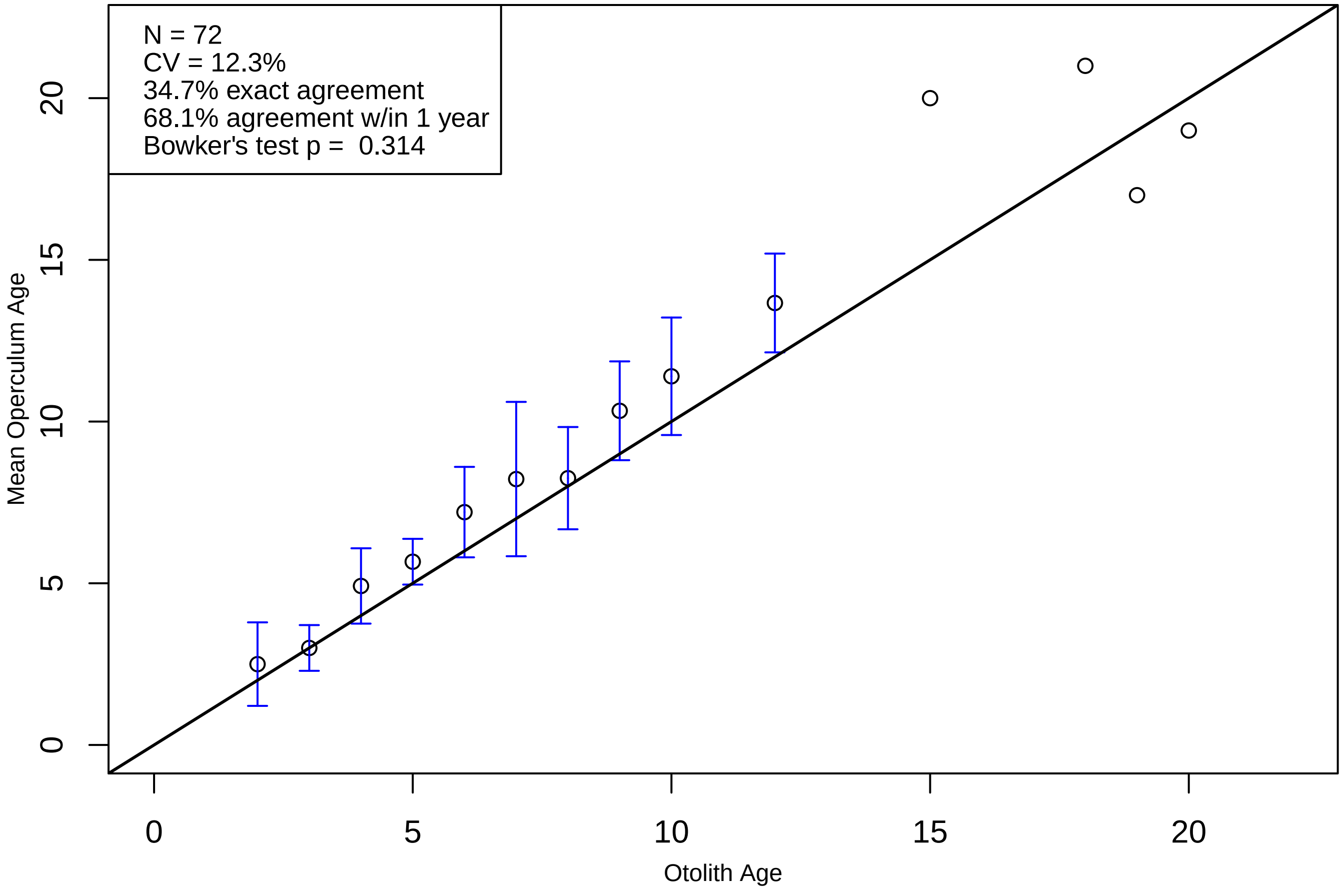


Figure 6: Mean operculum age vs. otolith age for NY. Error bars = standard deviation.

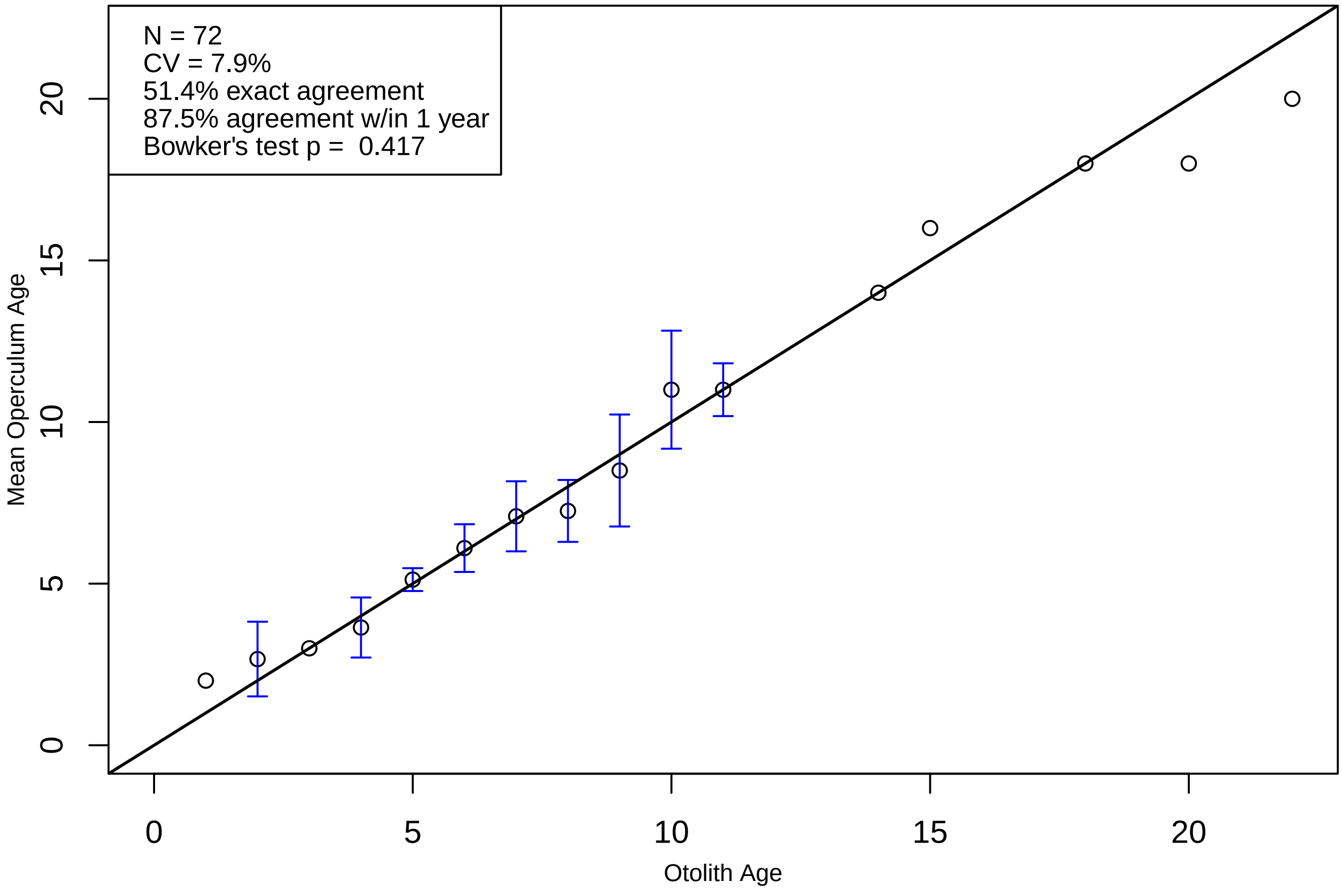


Figure 7: Mean operculum age vs. otolith age for CT. Error bars = standard deviation.

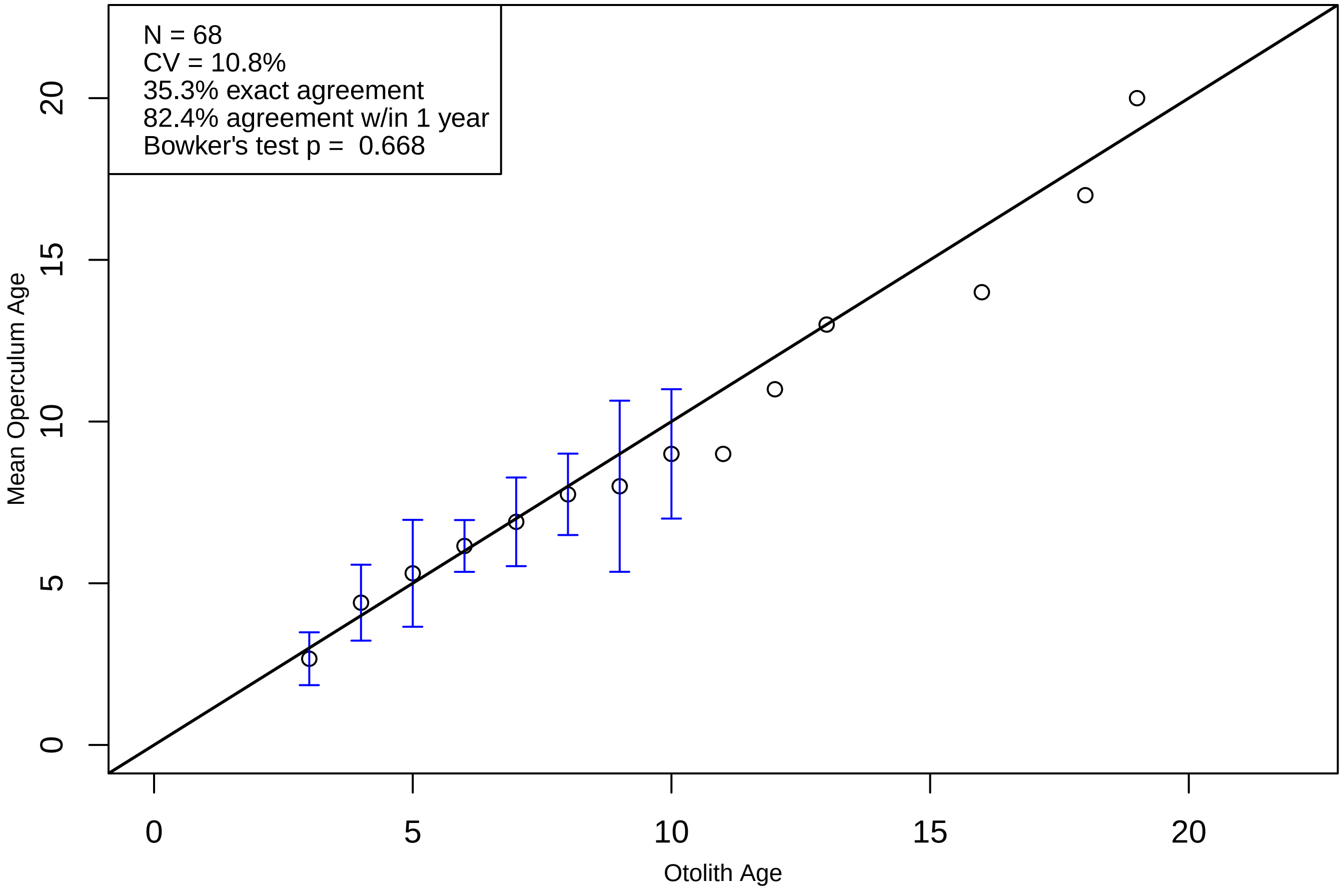


Figure 8: Mean operculum age vs. otolith age for RI. Error bars = standard deviation.

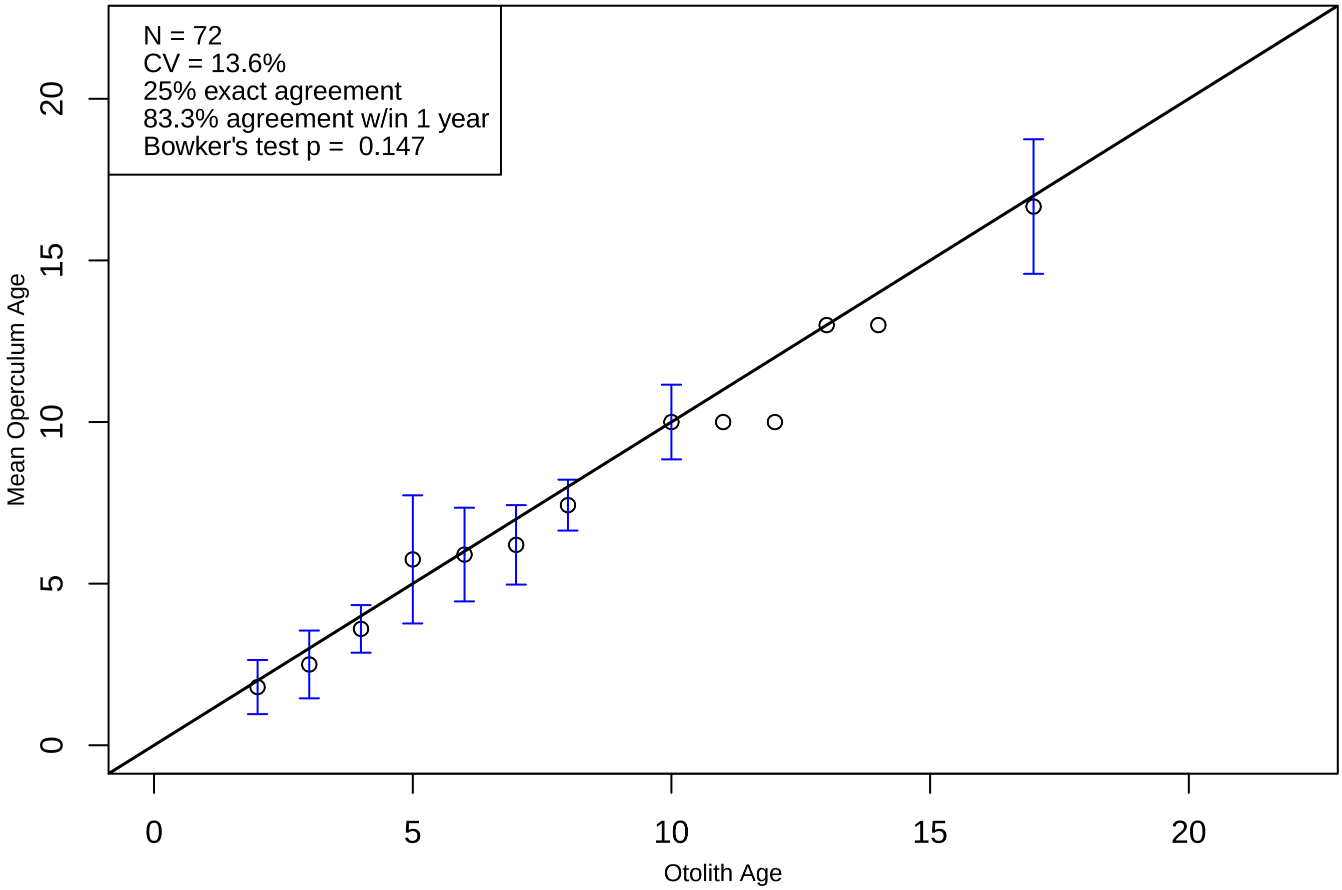


Figure 9: Mean operculum age vs. otolith age for MA. Error bars = standard deviation.

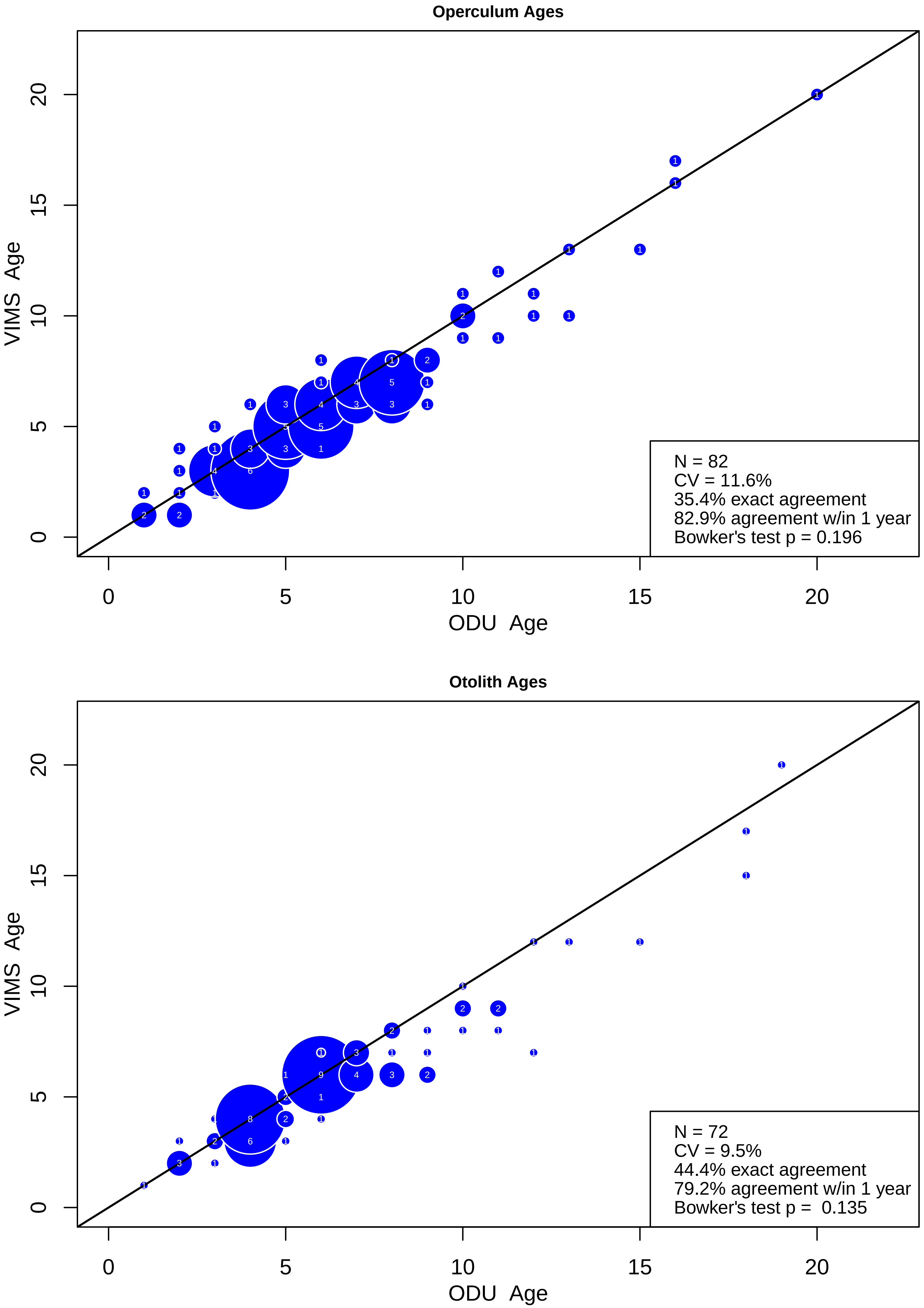
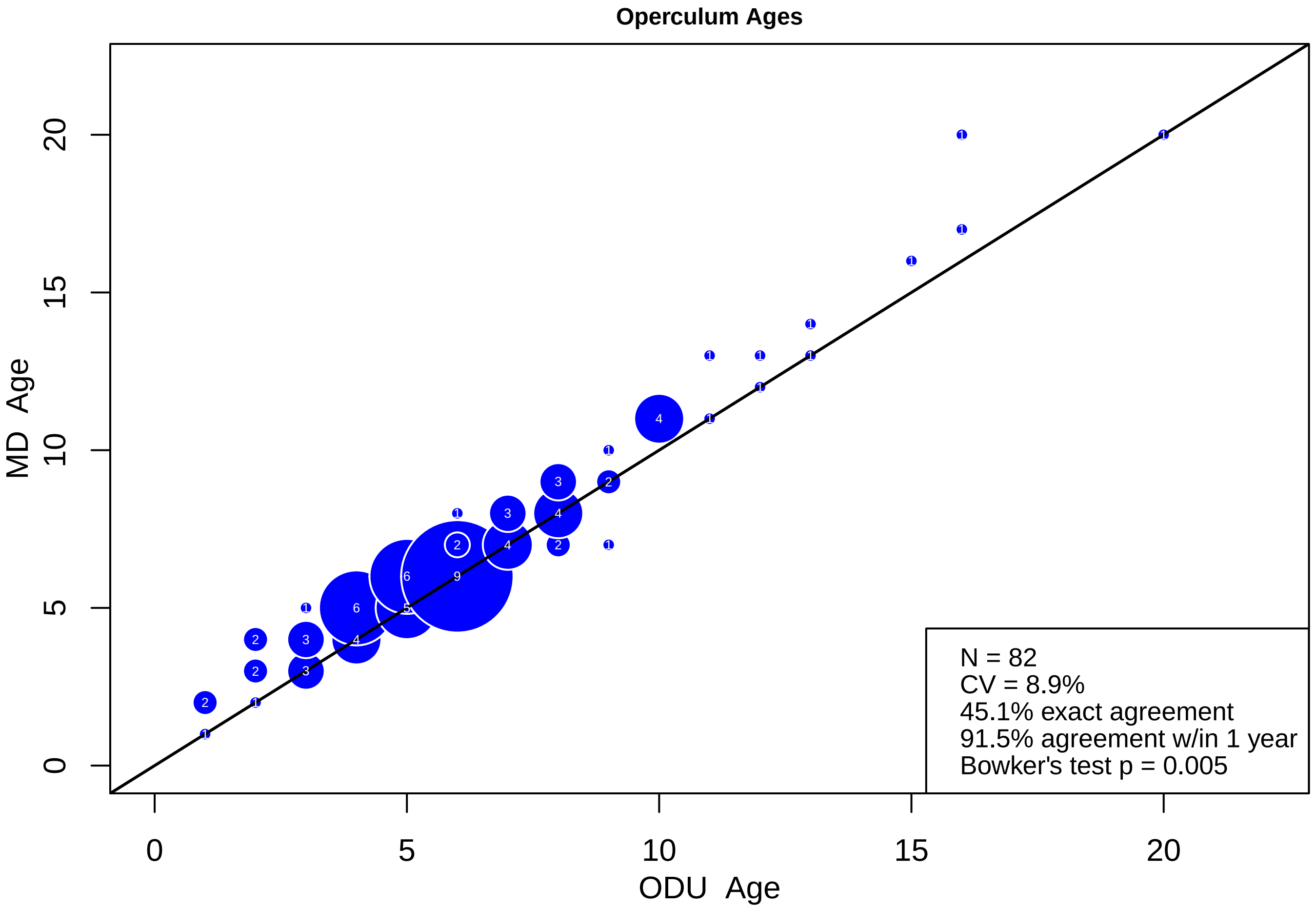


Figure 10: VIMS vs. ODU bias plots by hard part. Circles are proportional to number of observations.



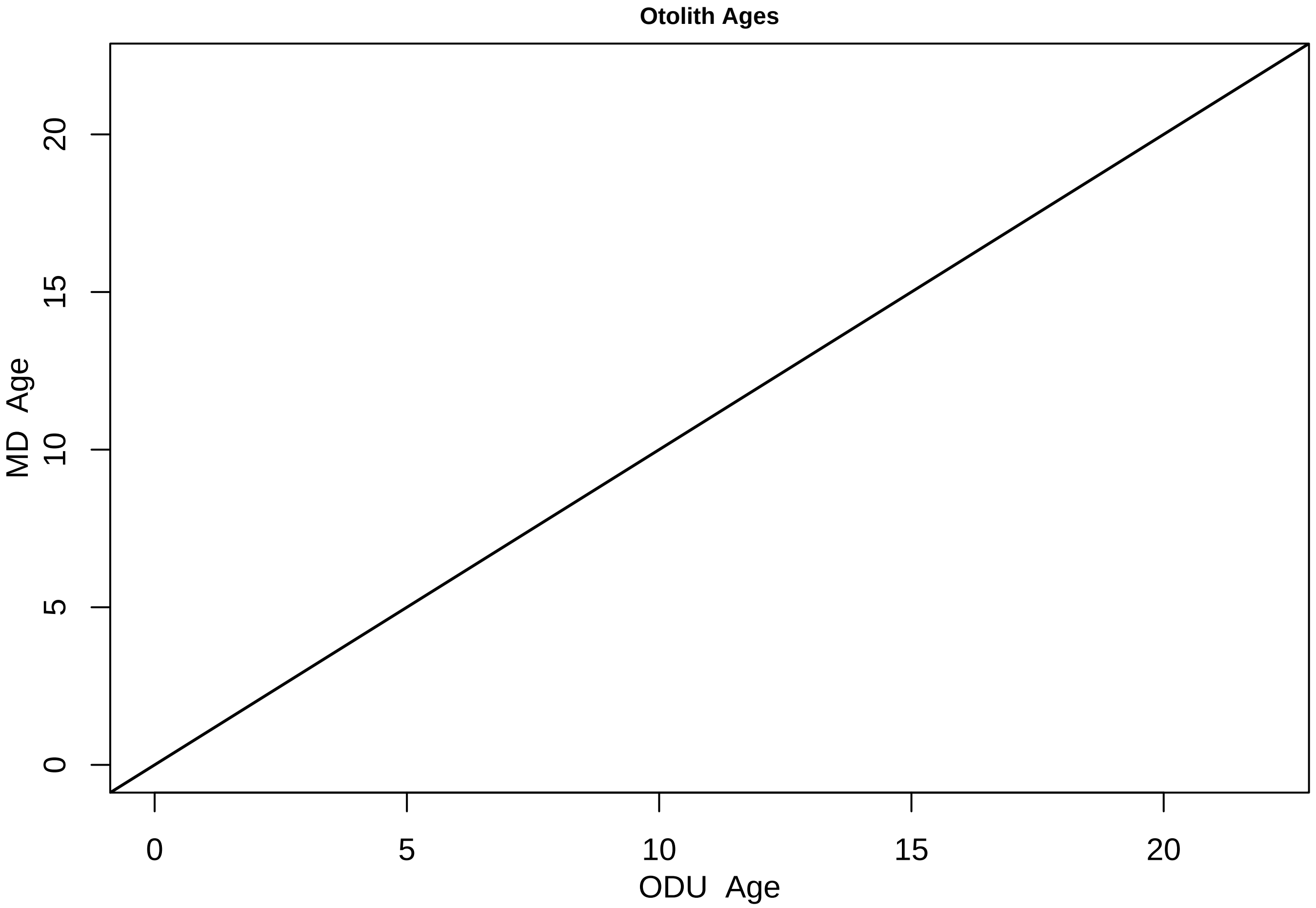
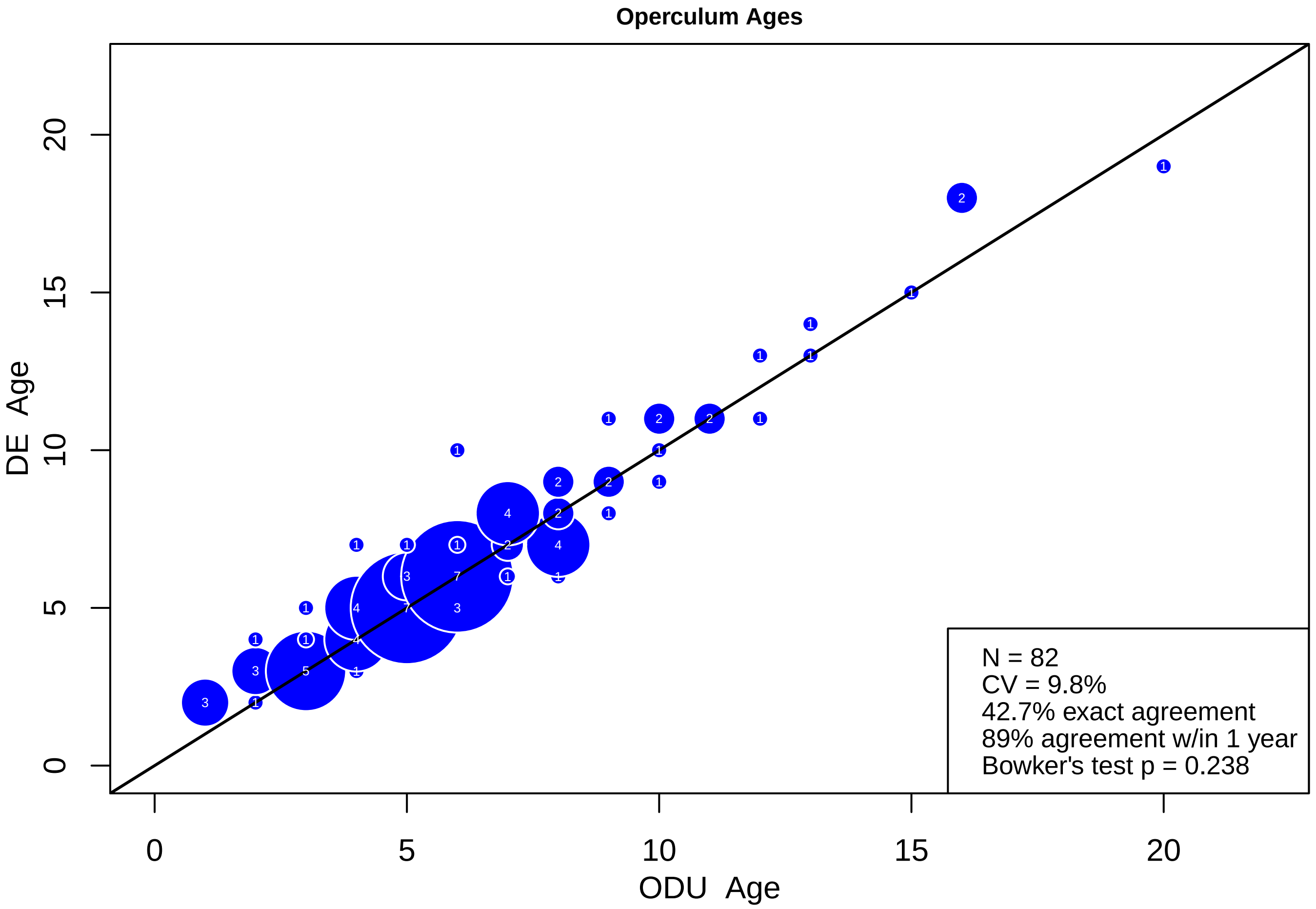


Figure 11: MD vs. ODU bias plots by hard part. Circles are proportional to number of observations.



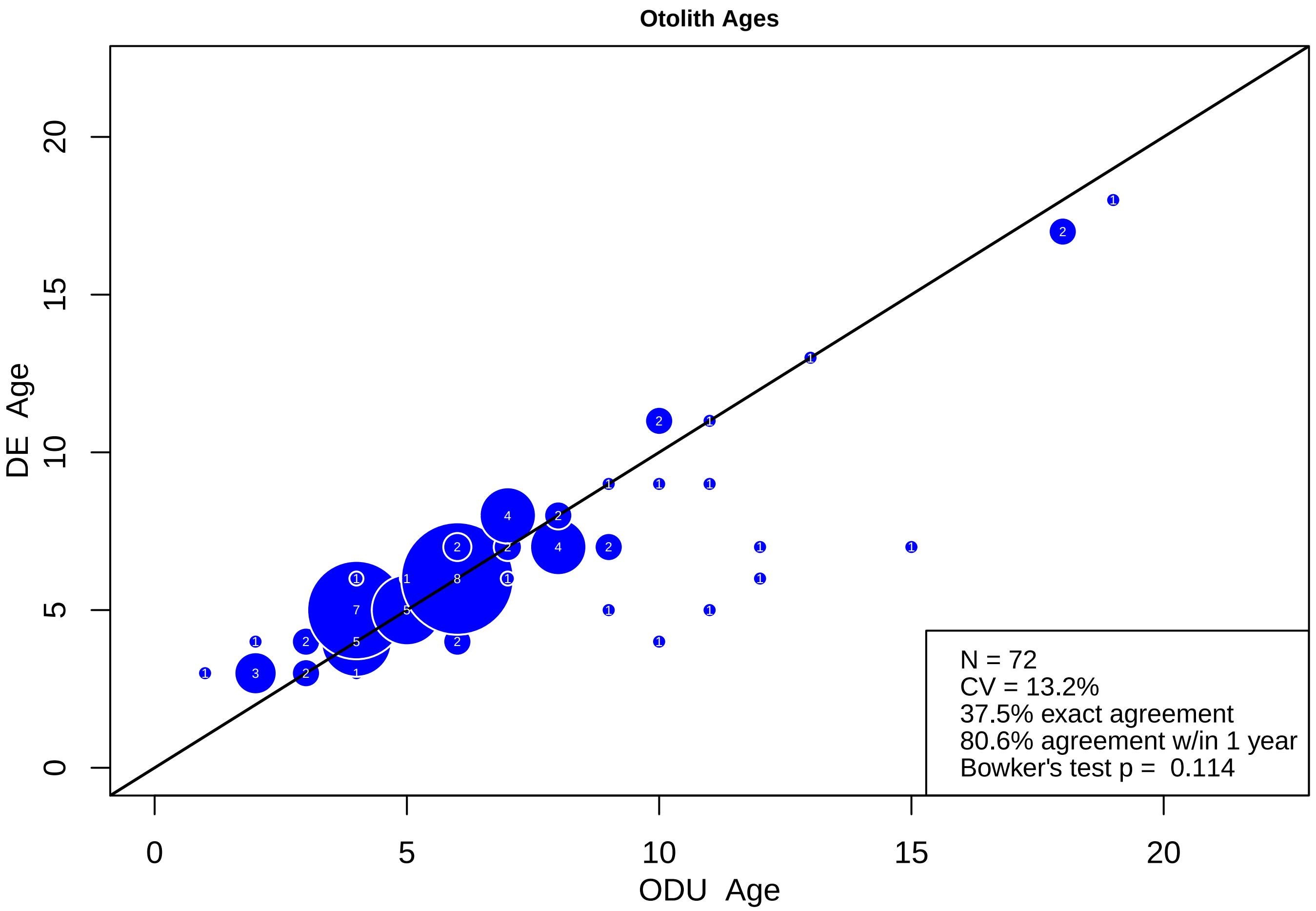


Figure 12: DE vs. ODU bias plots by hard part. Circles are proportional to number of observations.

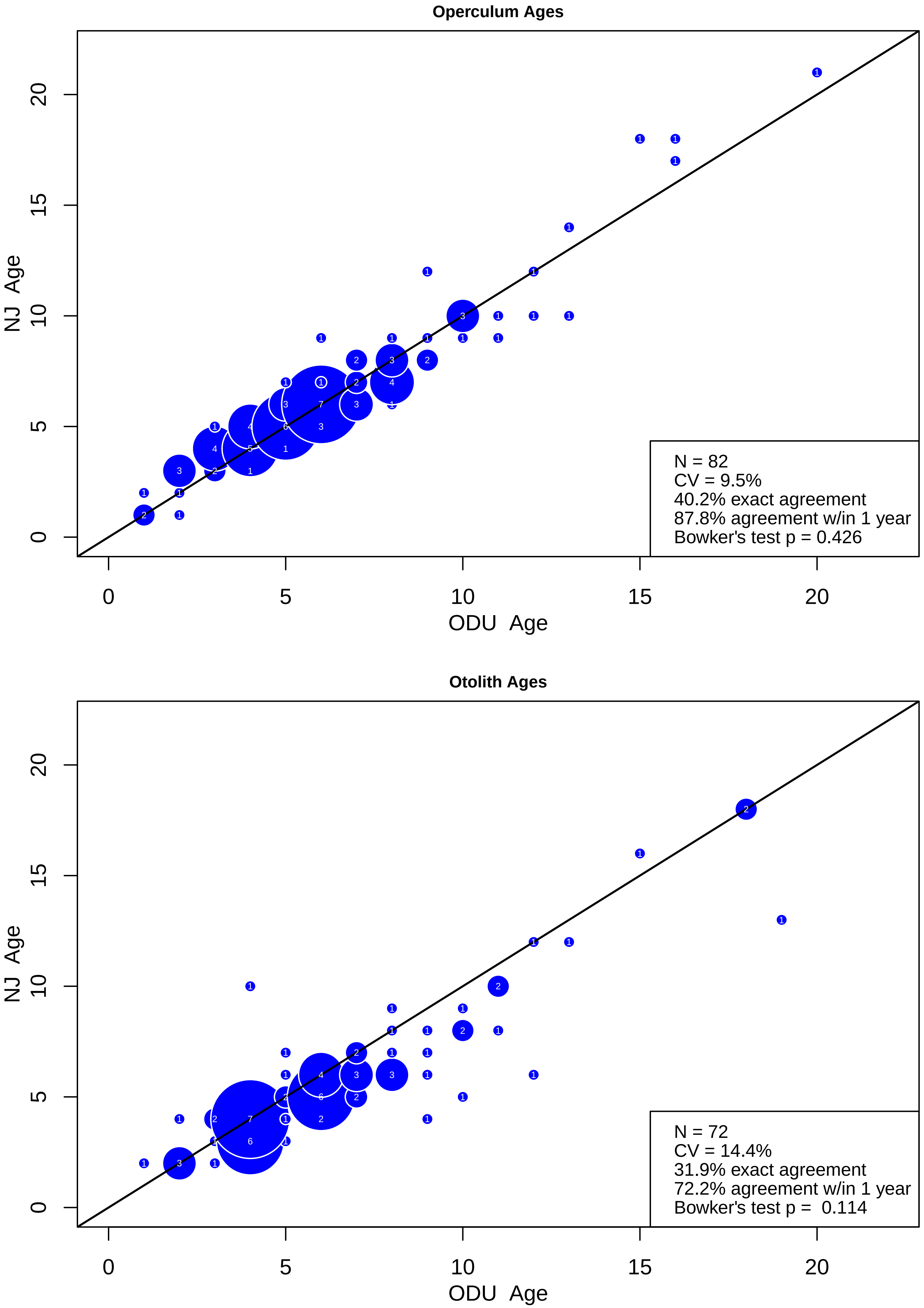
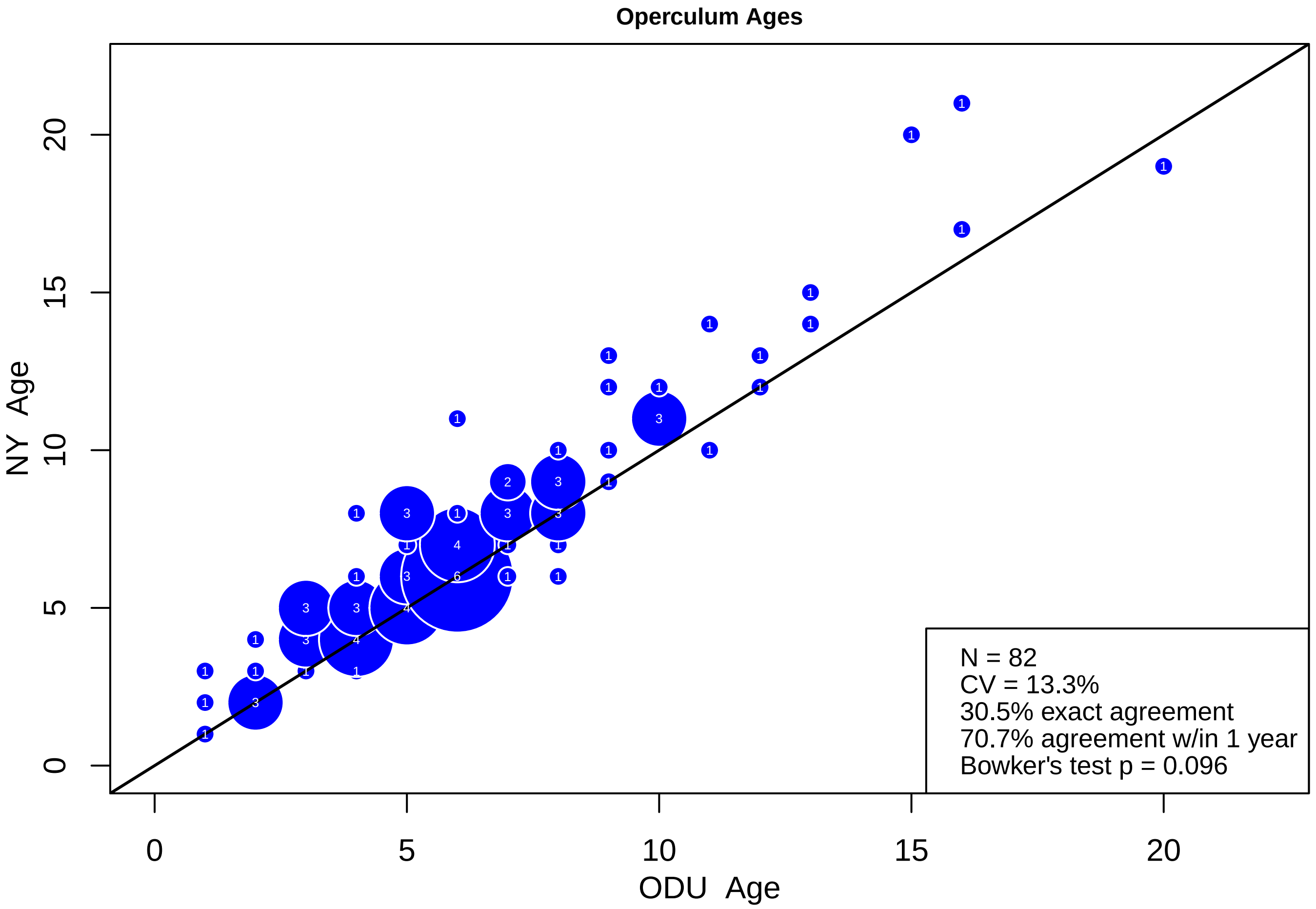


Figure 13: NJ vs. ODU bias plots by hard part. Circles are proportional to number of observations.



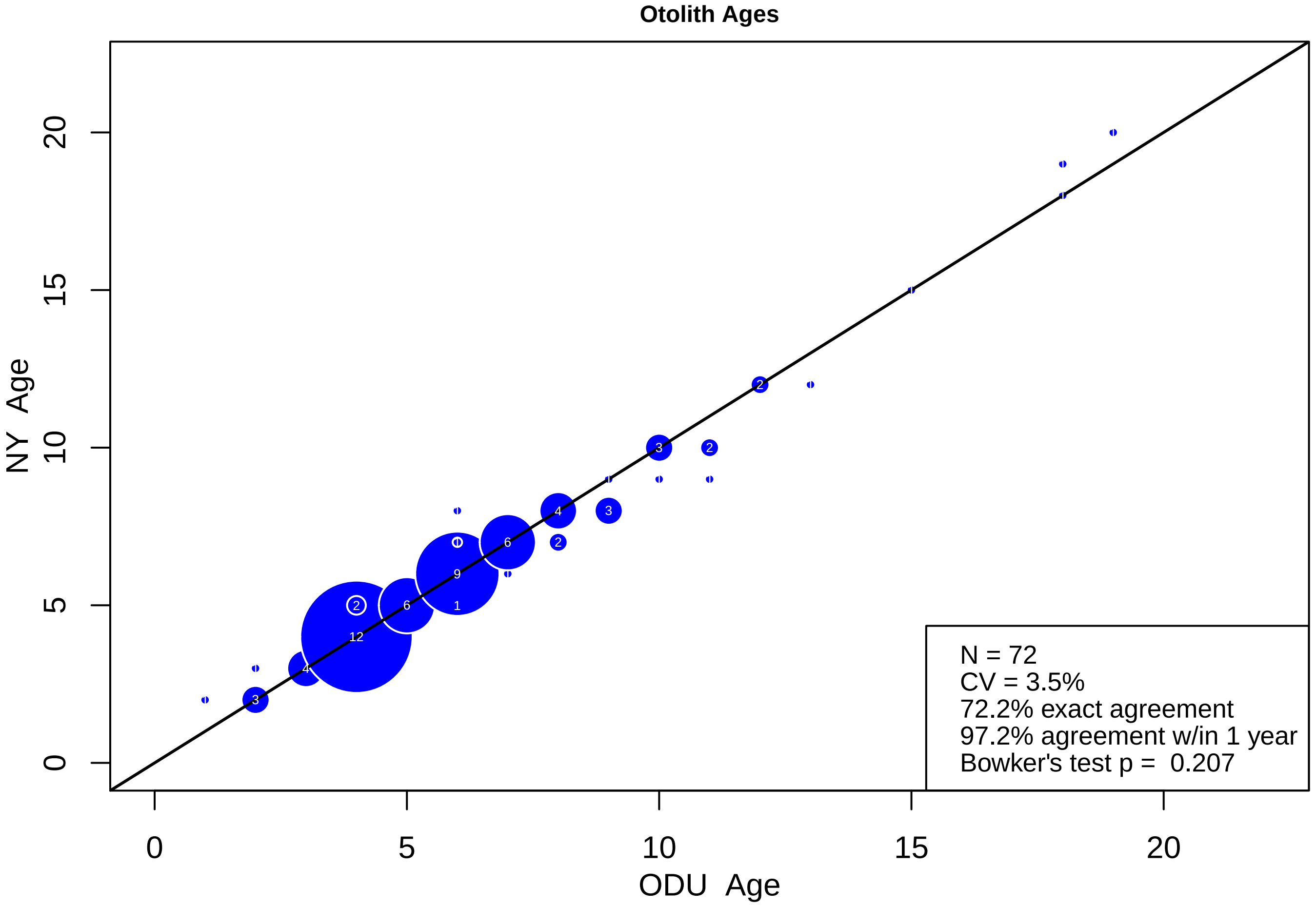


Figure 14: NY vs. ODU bias plots by hard part. Circles are proportional to number of observations.

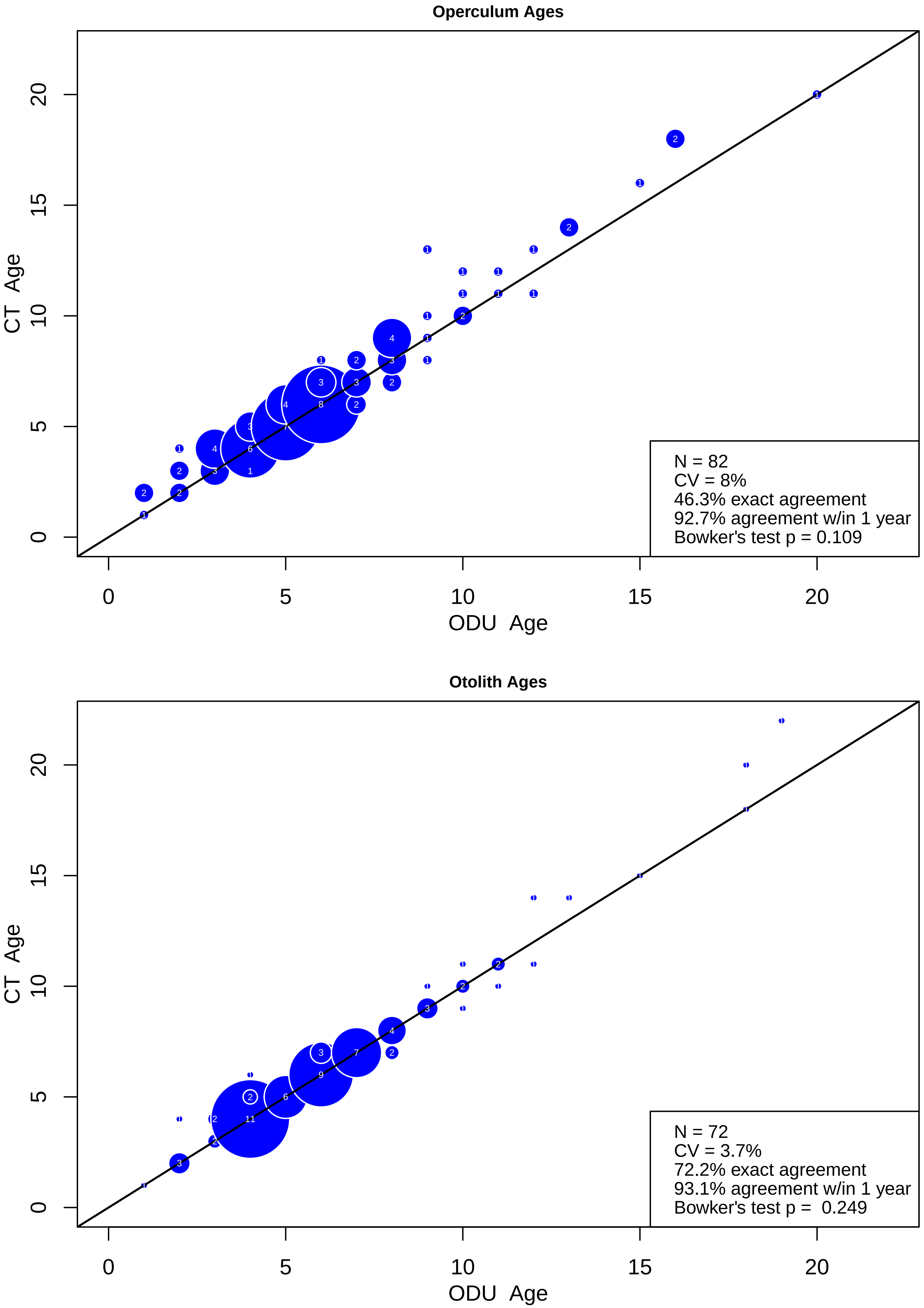
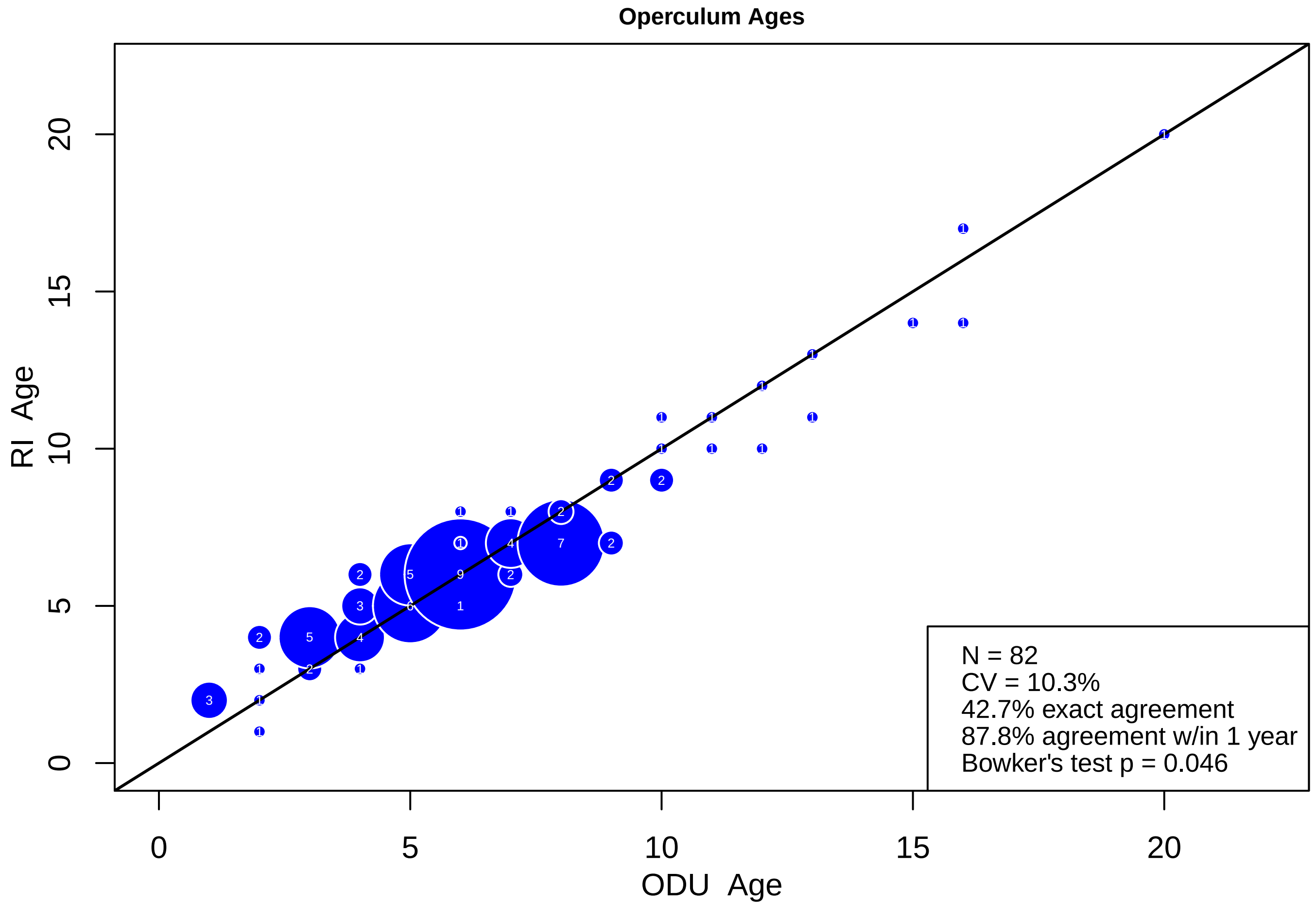


Figure 15: CT vs. ODU bias plots by hard part. Circles are proportional to number of observations.



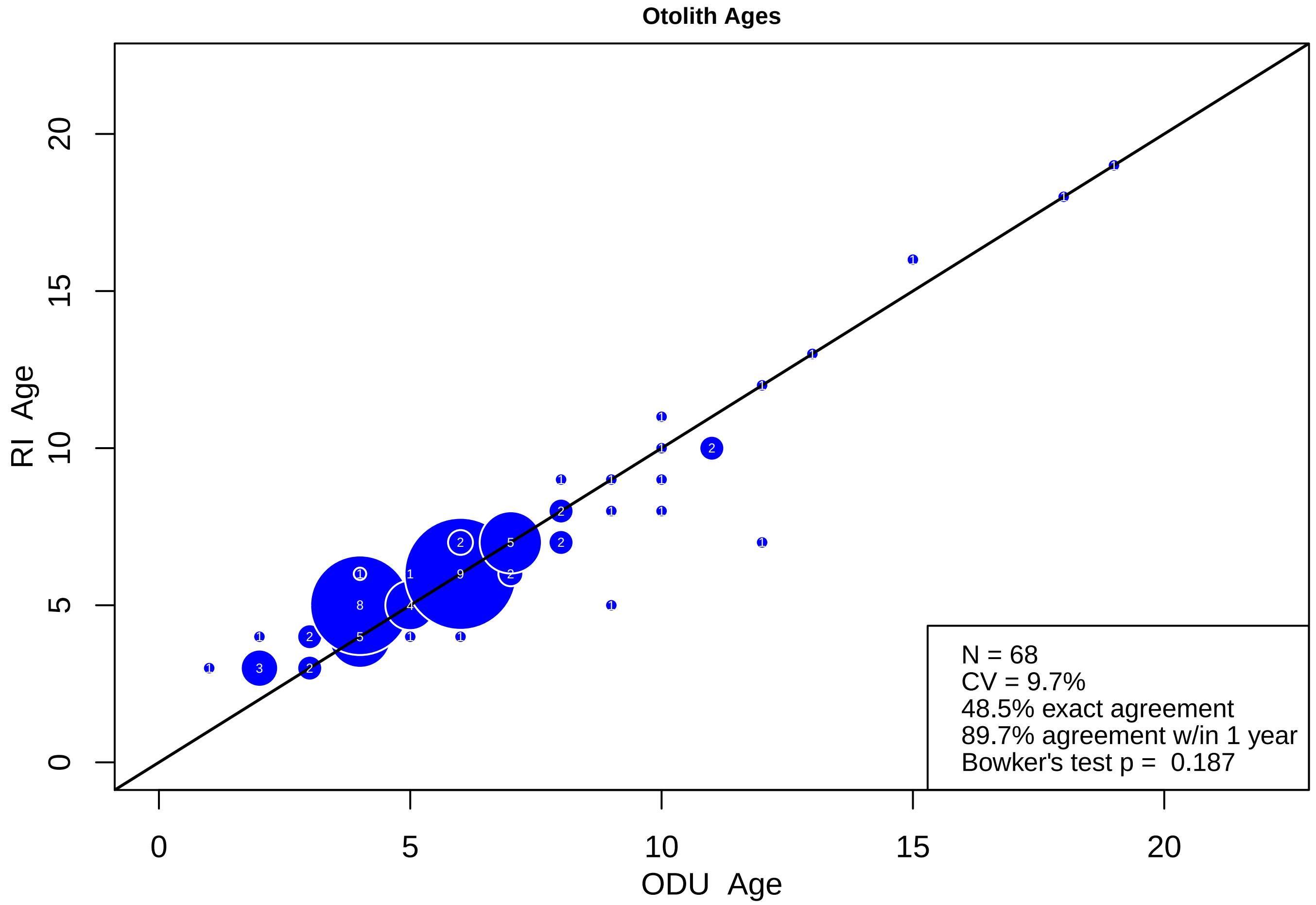
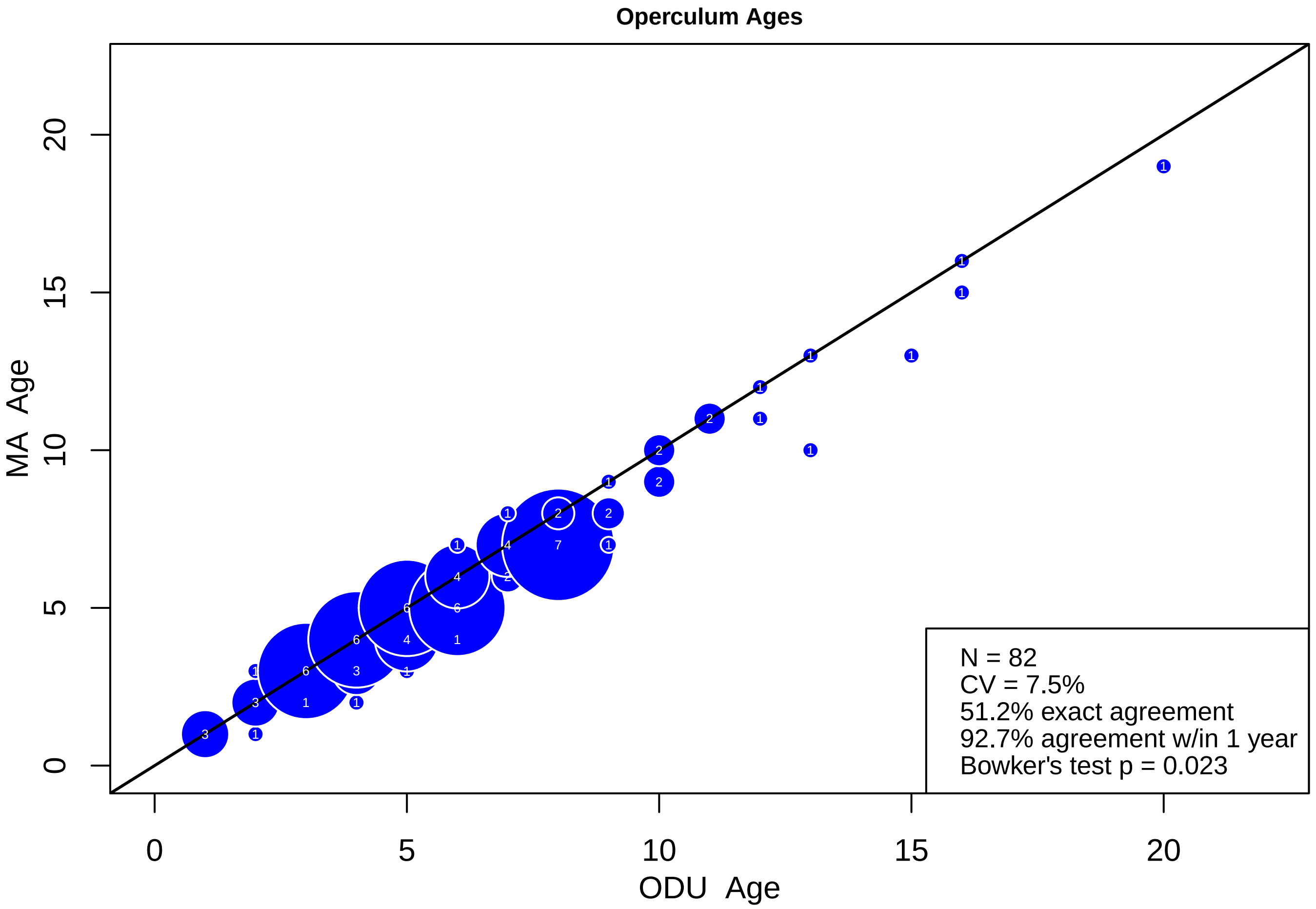


Figure 16: RI vs. ODU bias plots by hard part. Circles are proportional to number of observations.



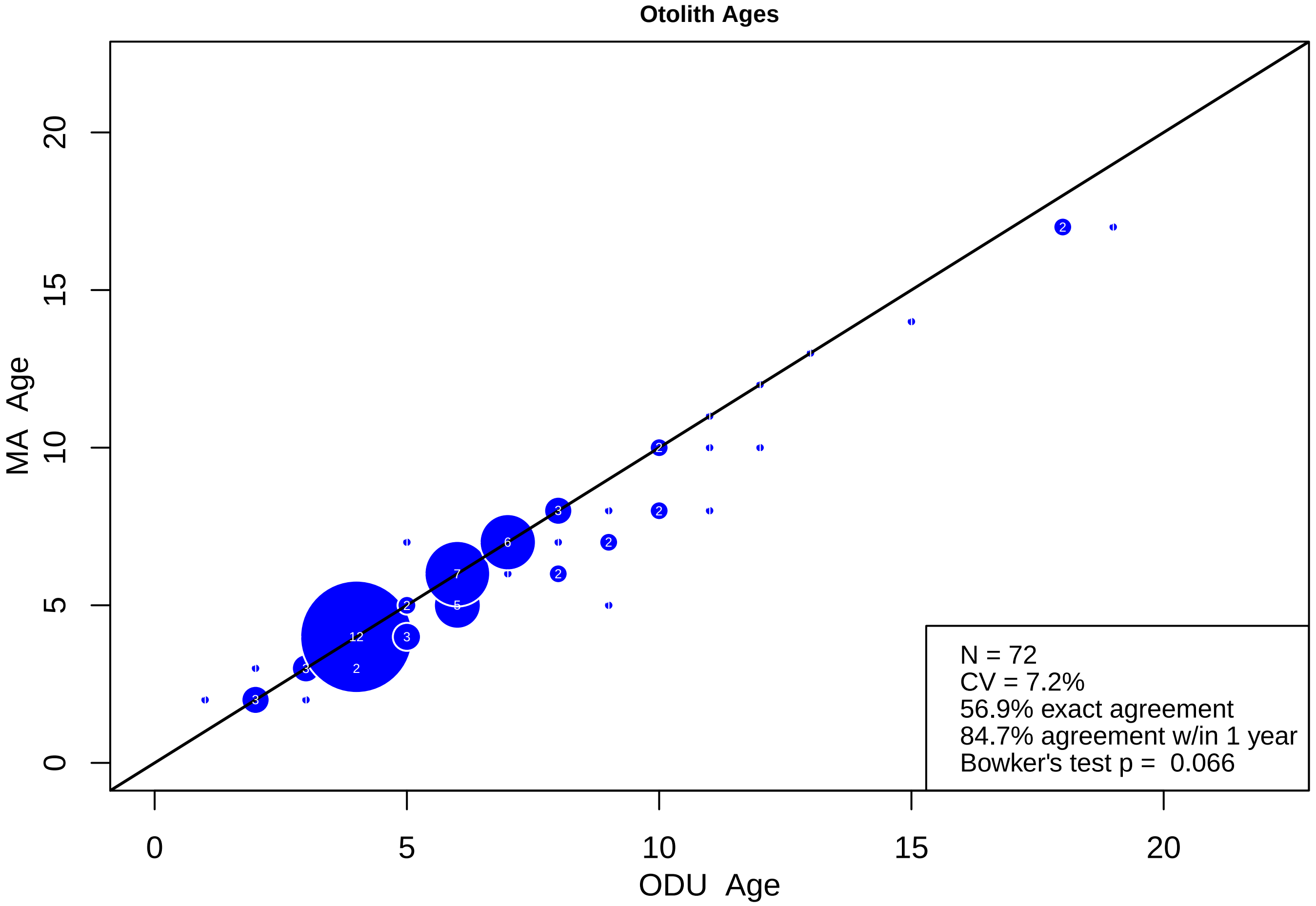
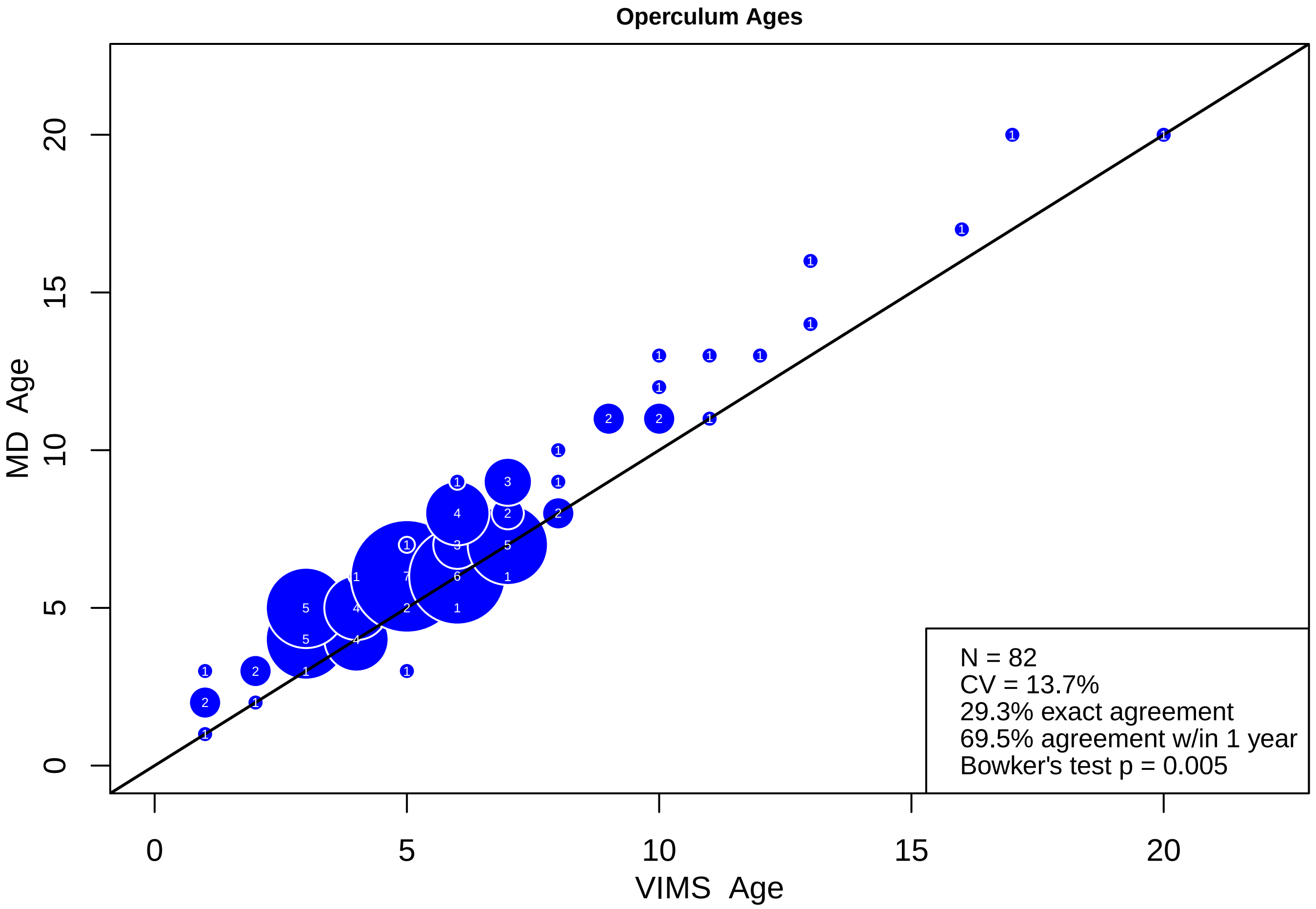


Figure 17: MA vs. ODU bias plots by hard part. Circles are proportional to number of observations.



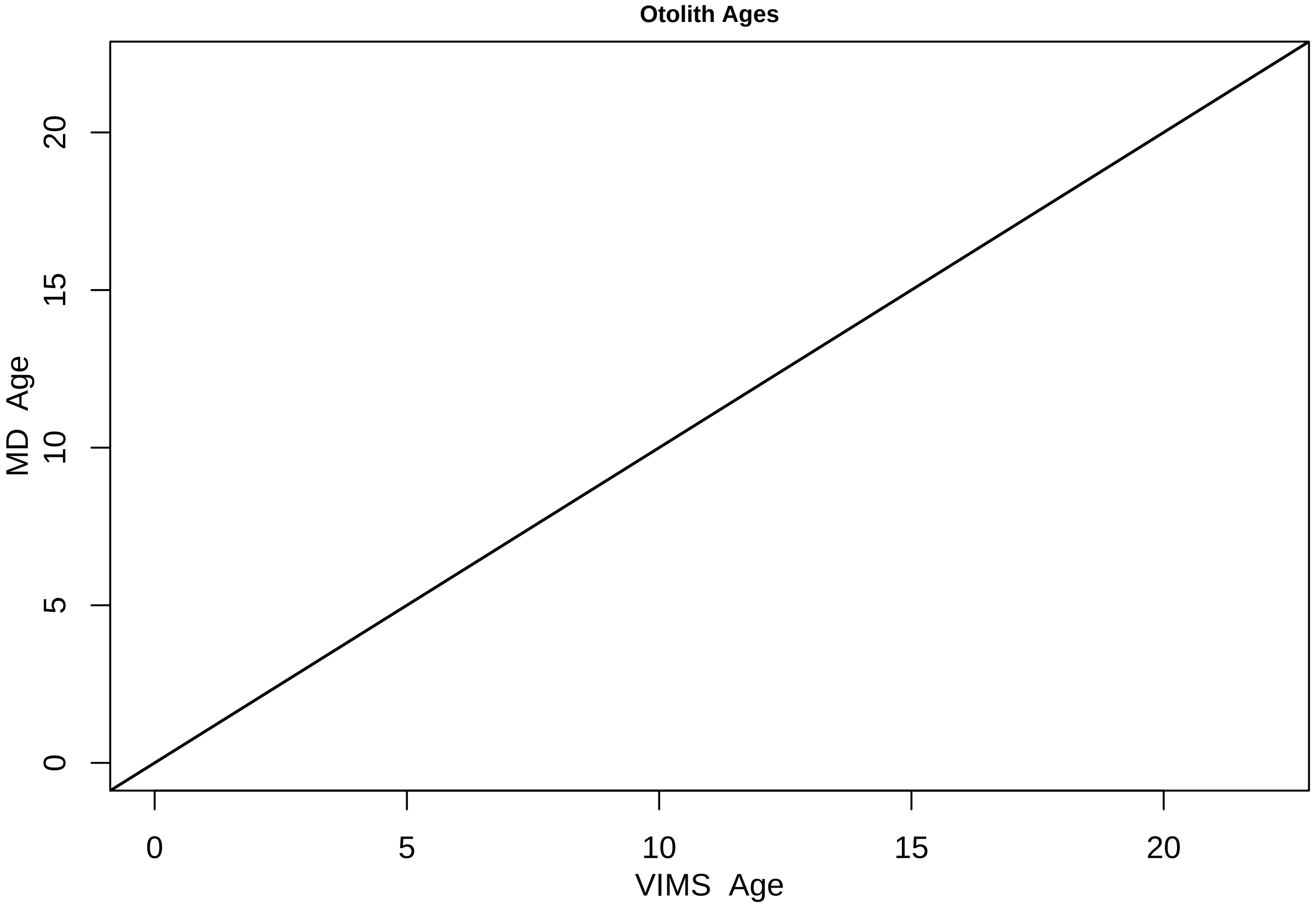
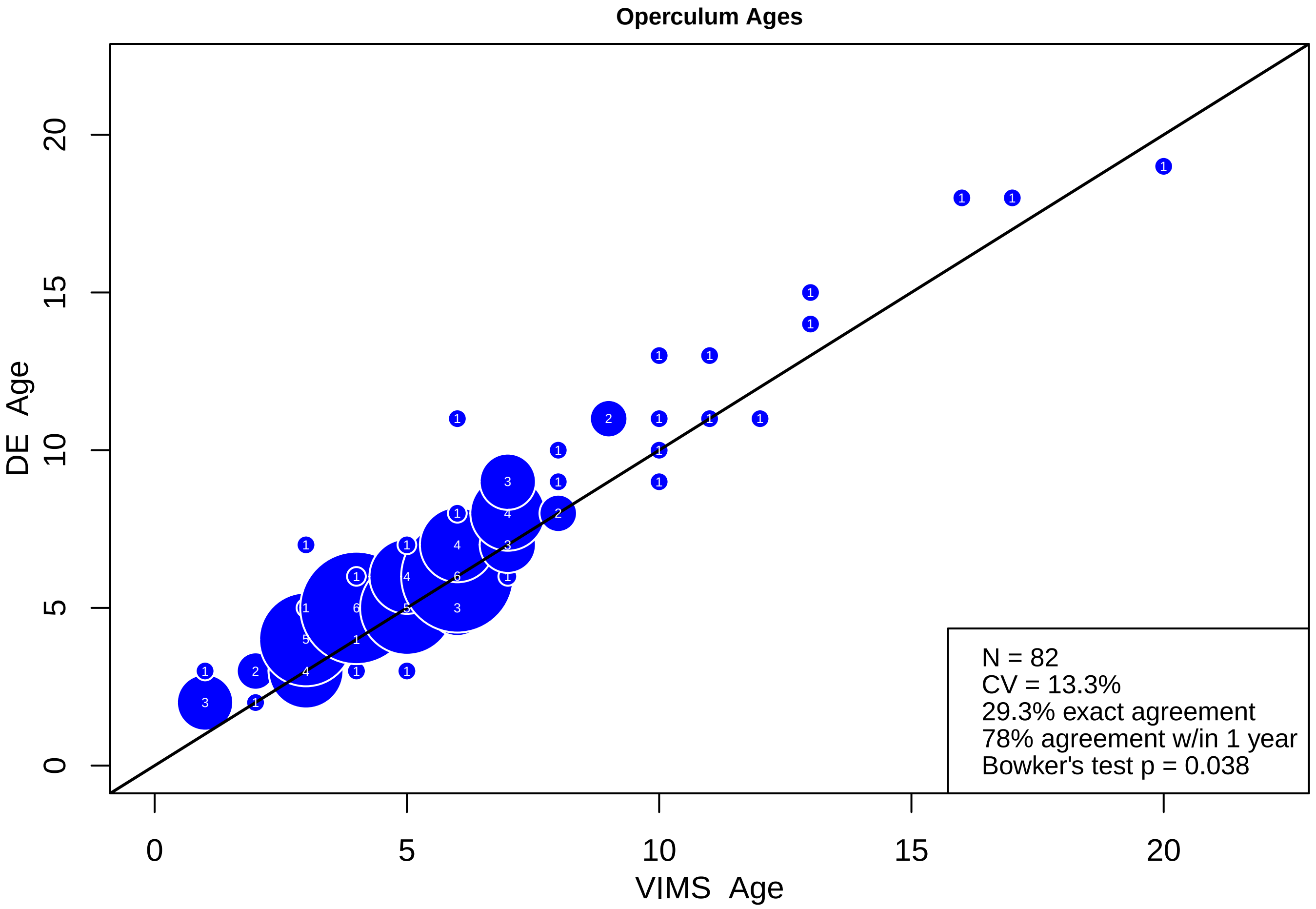


Figure 18: MD vs. VIMS bias plots by hard part. Circles are proportional to number of observations.



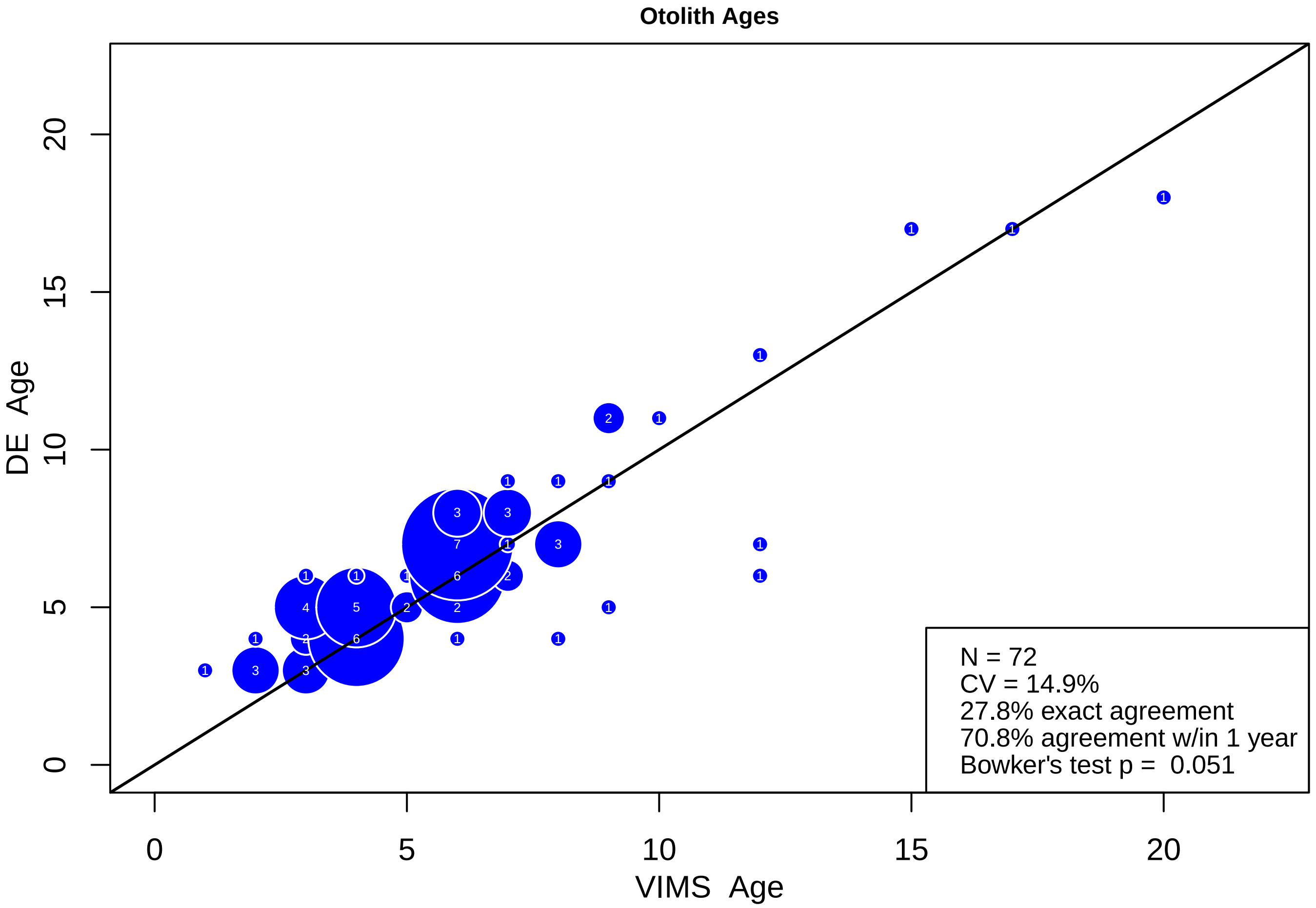
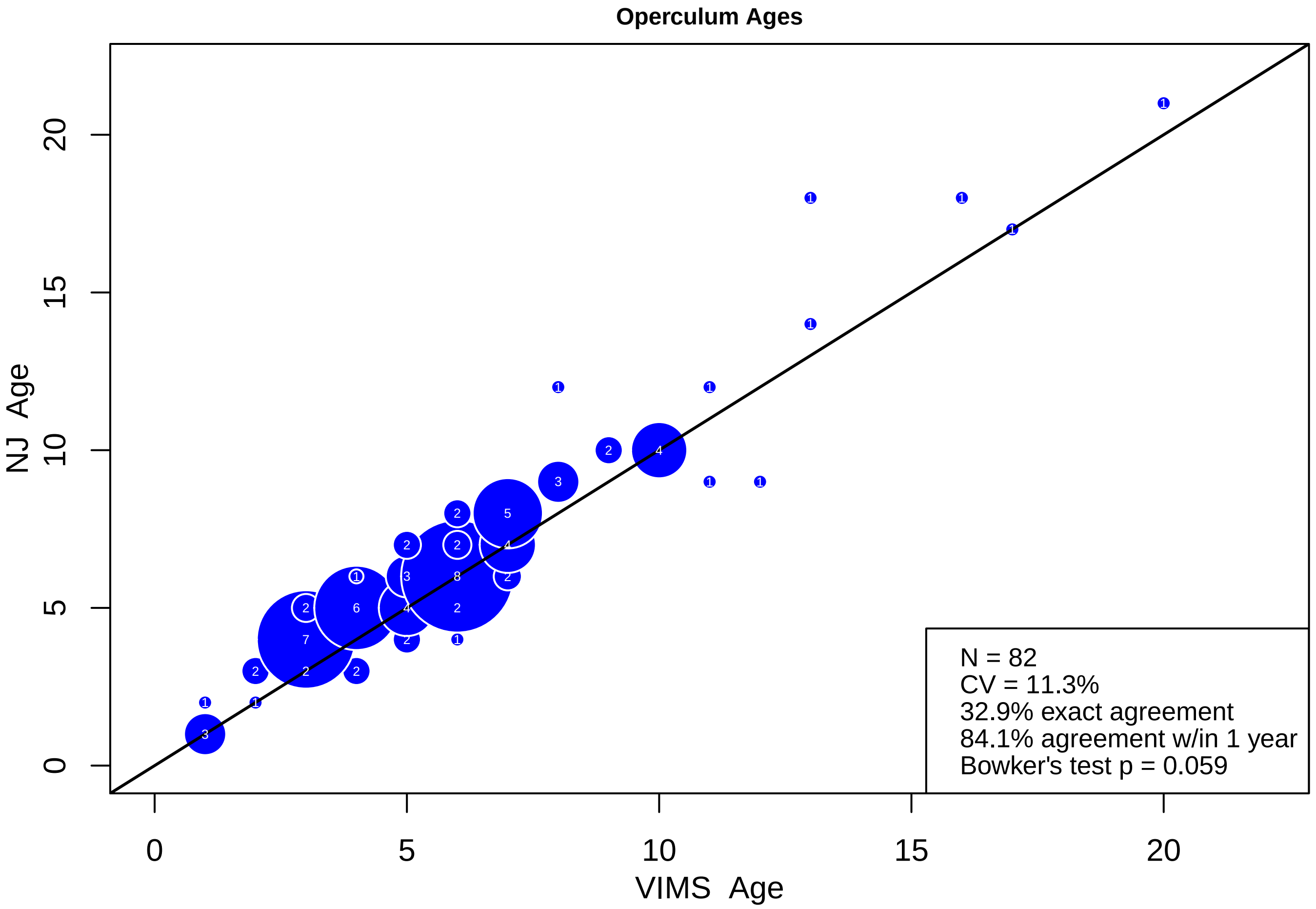


Figure 19: DE vs. VIMS bias plots by hard part. Circles are proportional to number of observations.



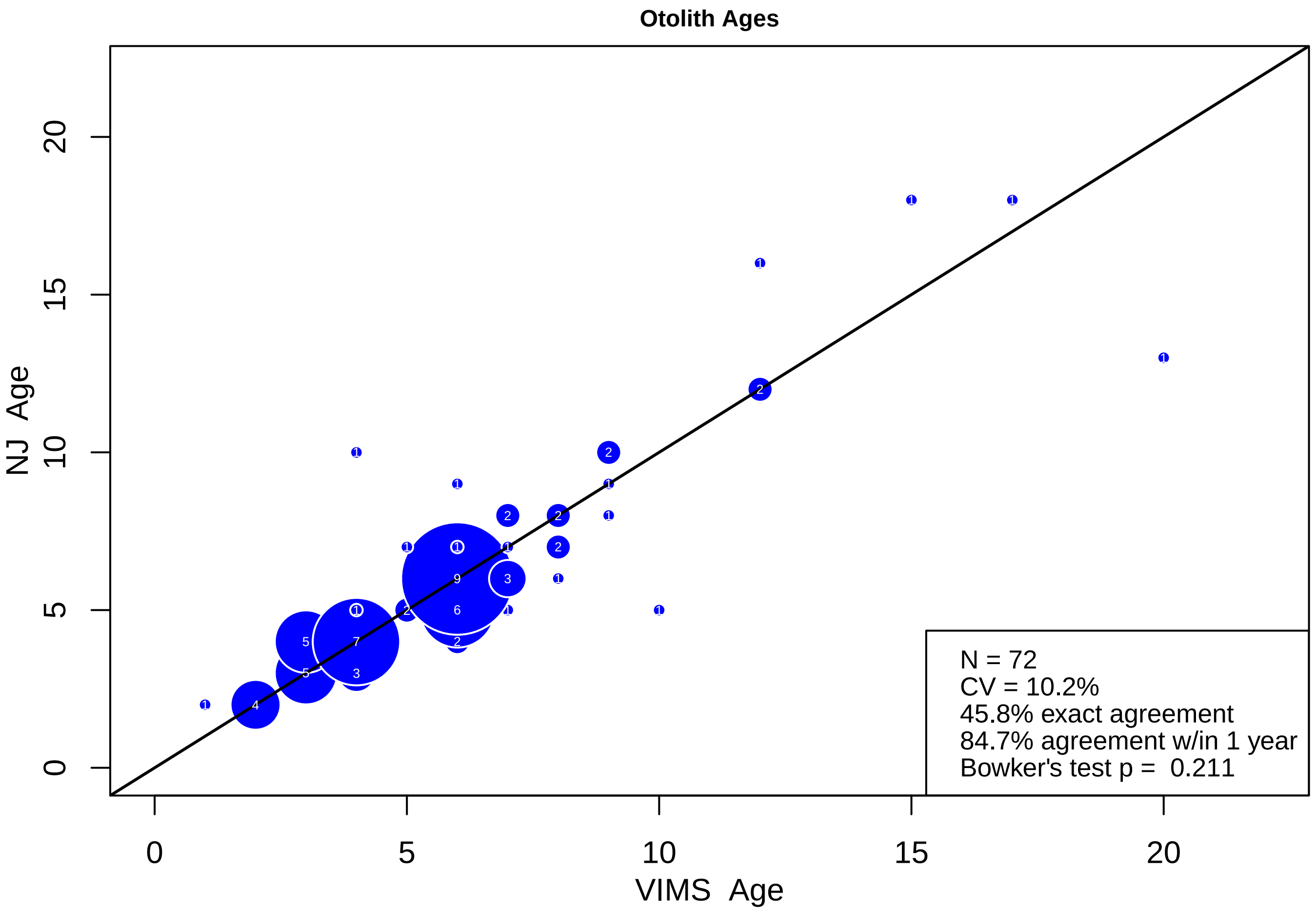
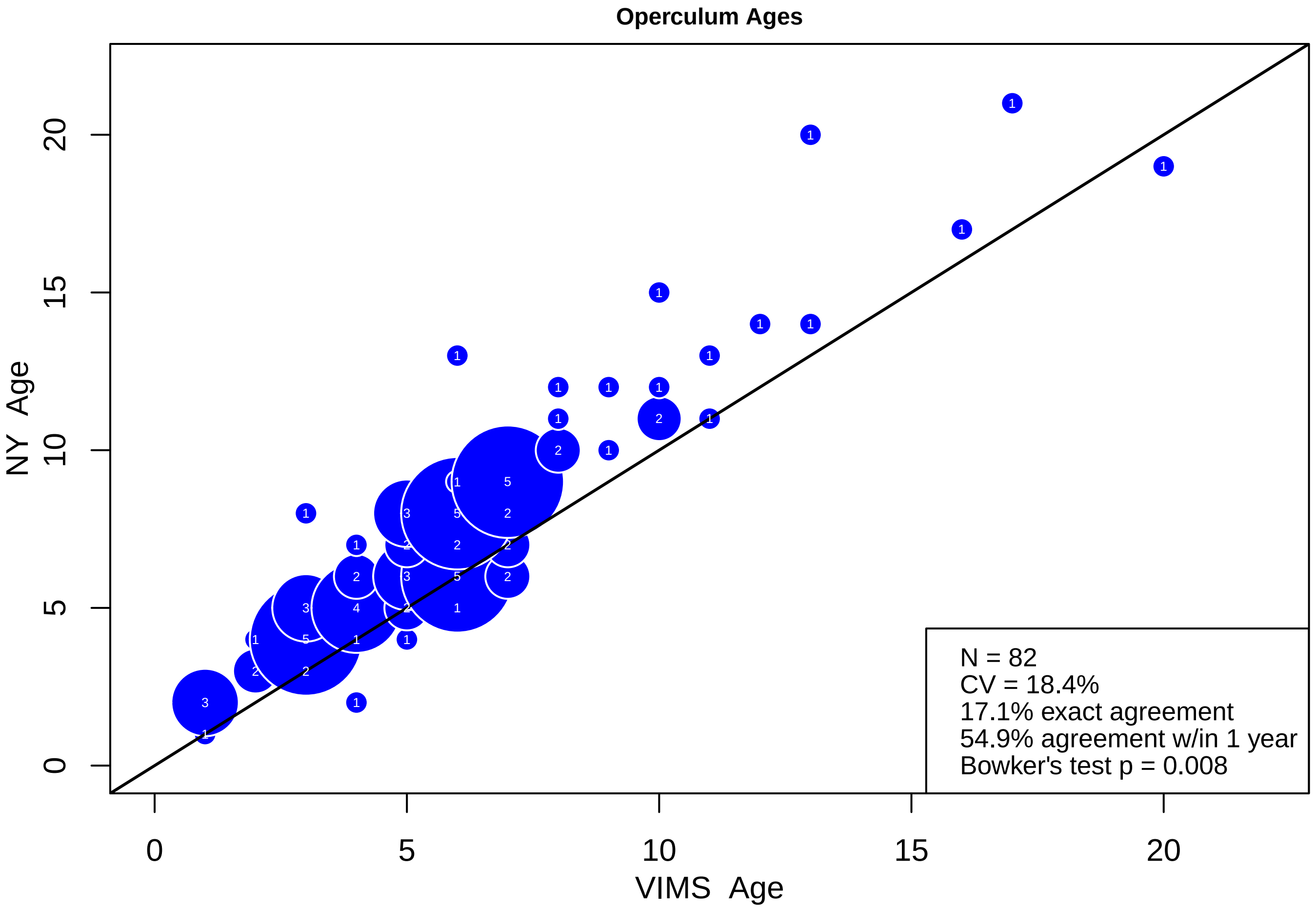


Figure 20: NJ vs. VIMS bias plots by hard part. Circles are proportional to number of observations.



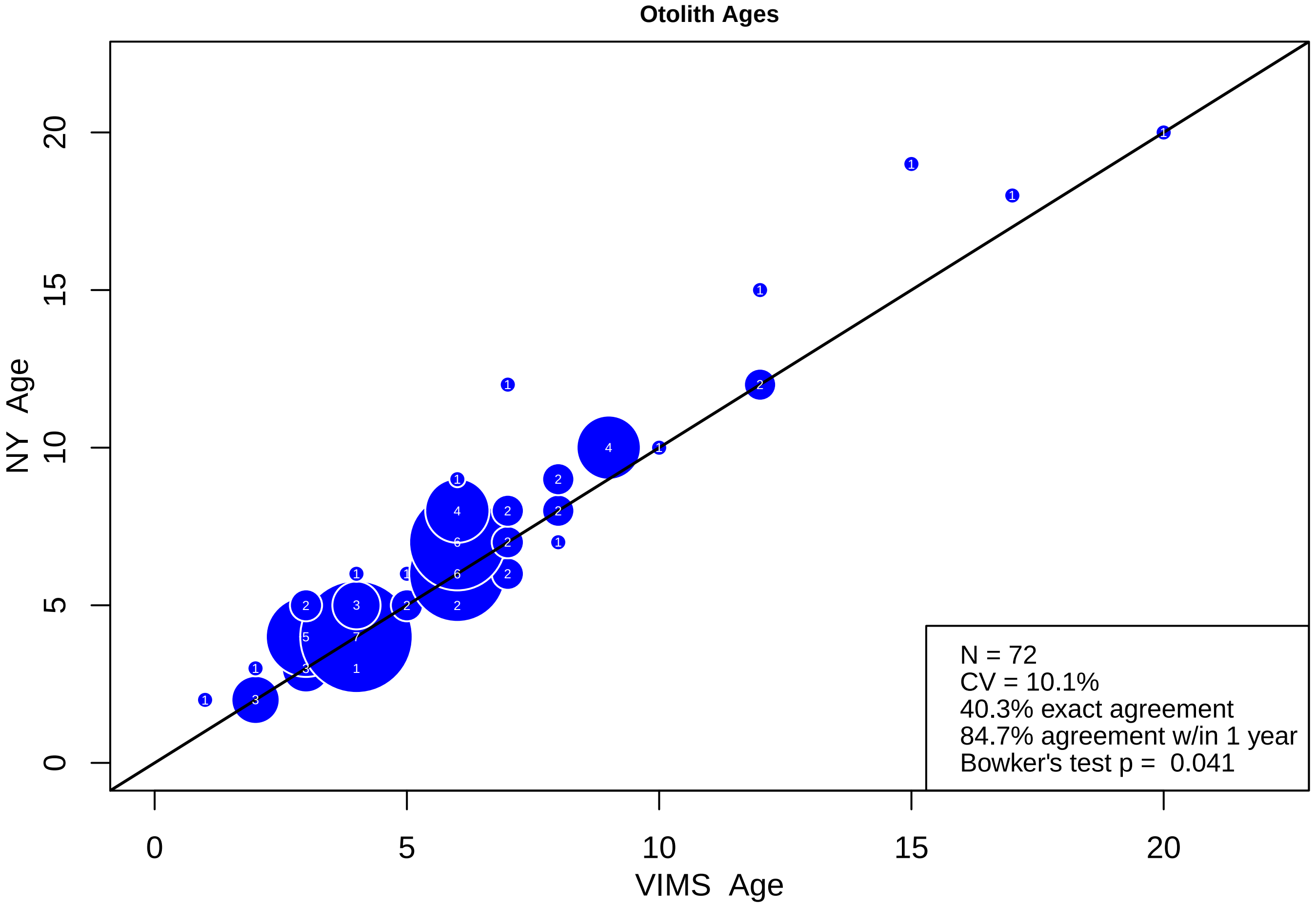
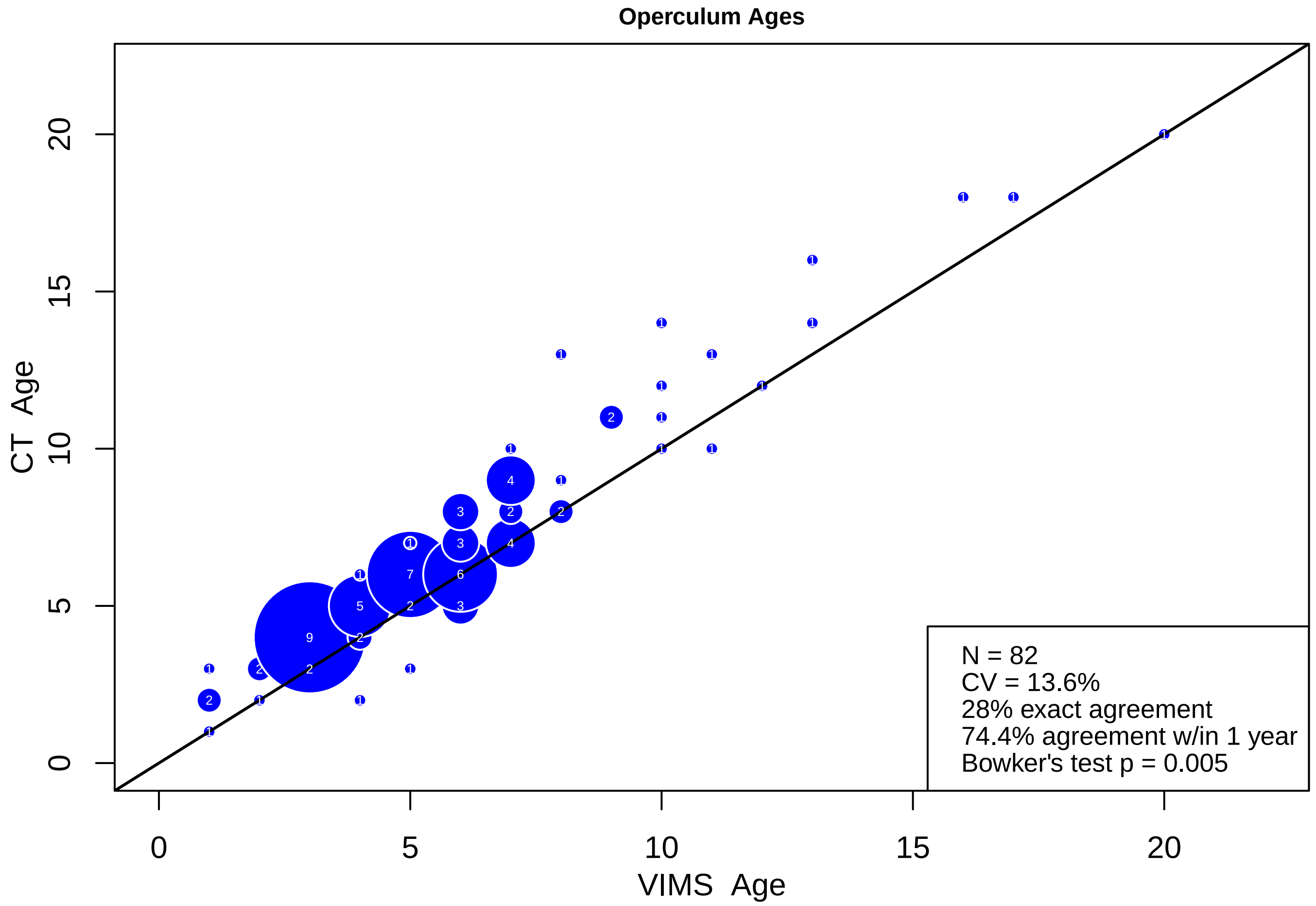


Figure 21: NY vs. VIMS bias plots by hard part. Circles are proportional to number of observations.



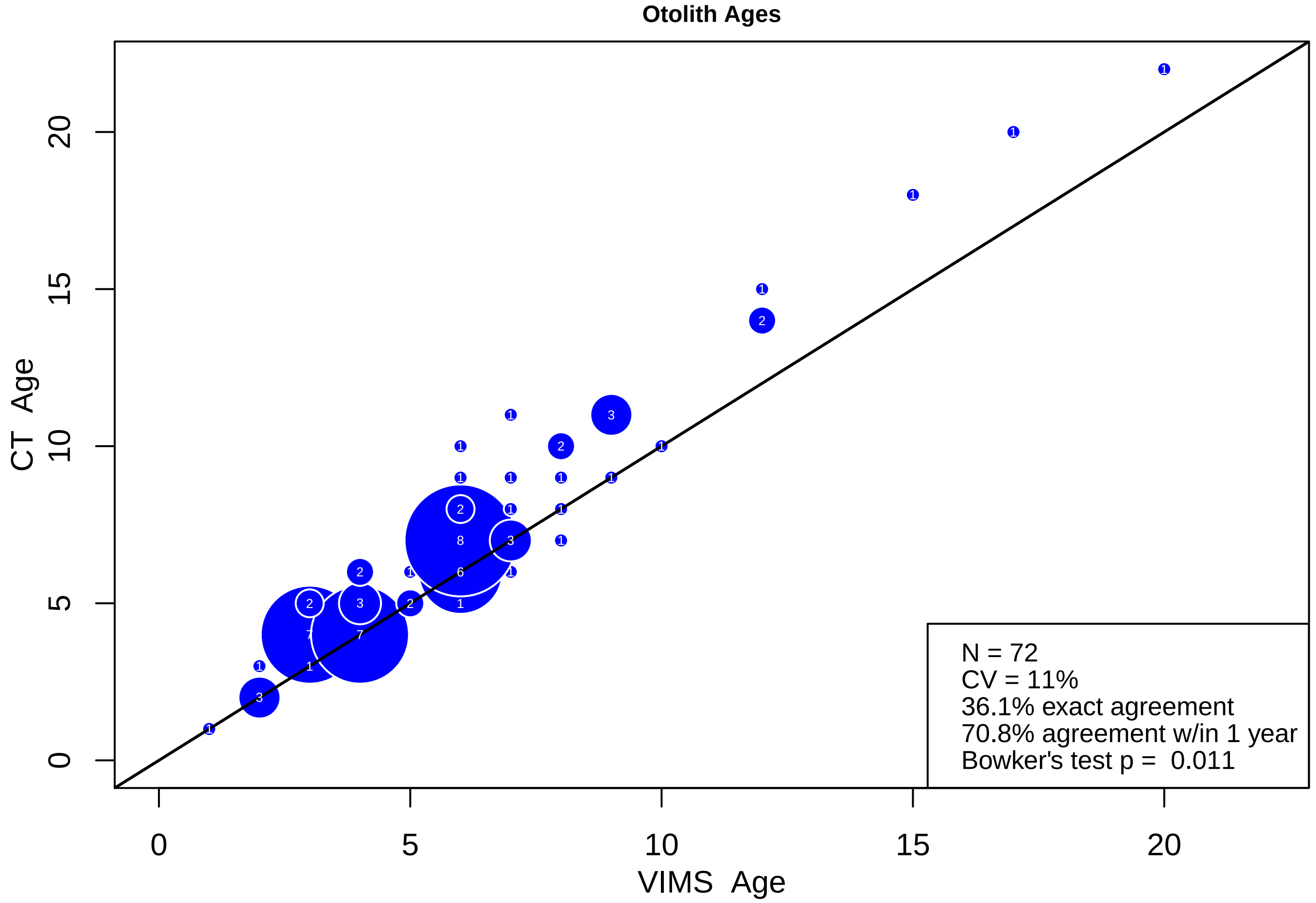


Figure 22: CT vs. VIMS bias plots by hard part. Circles are proportional to number of observations.

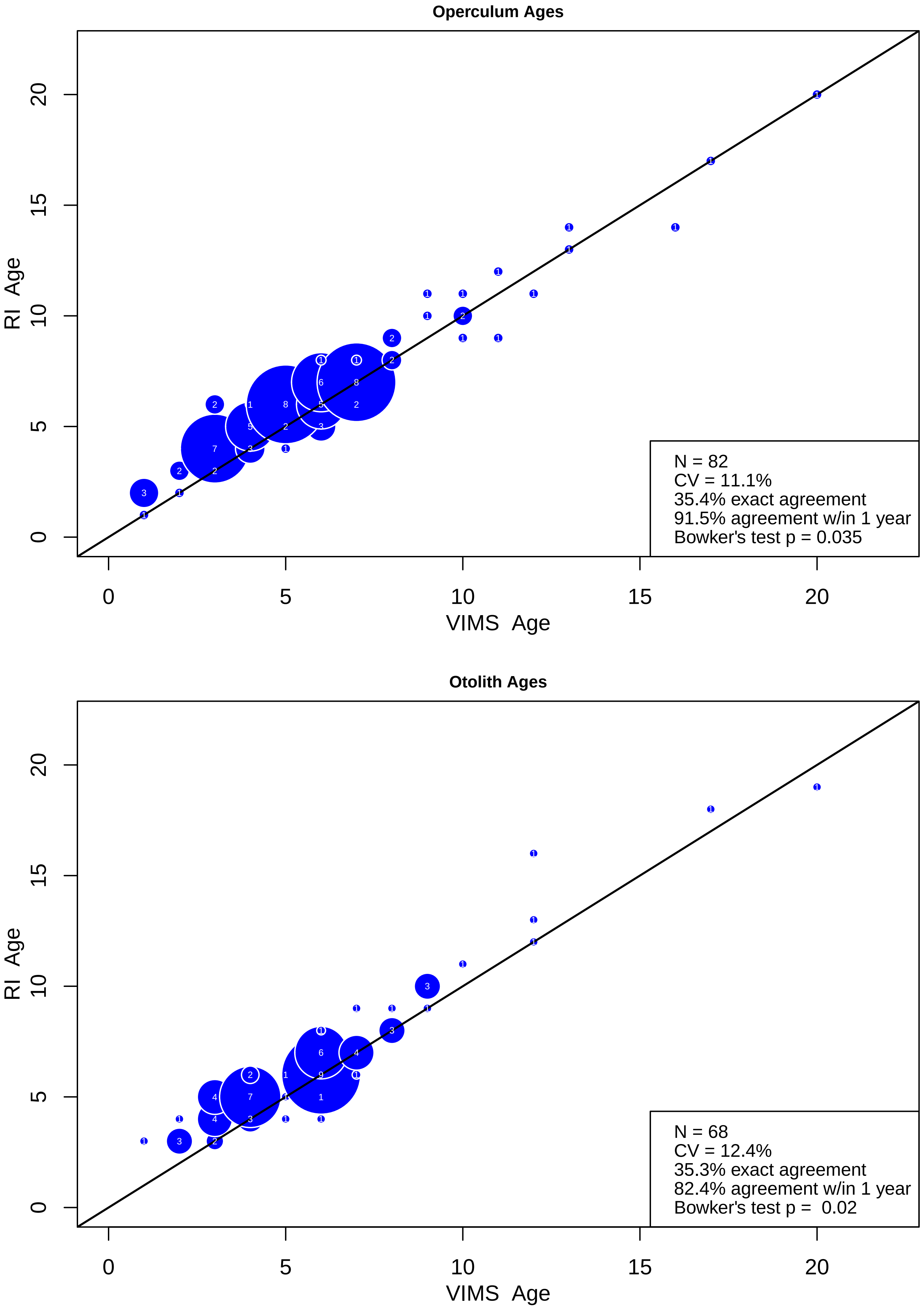
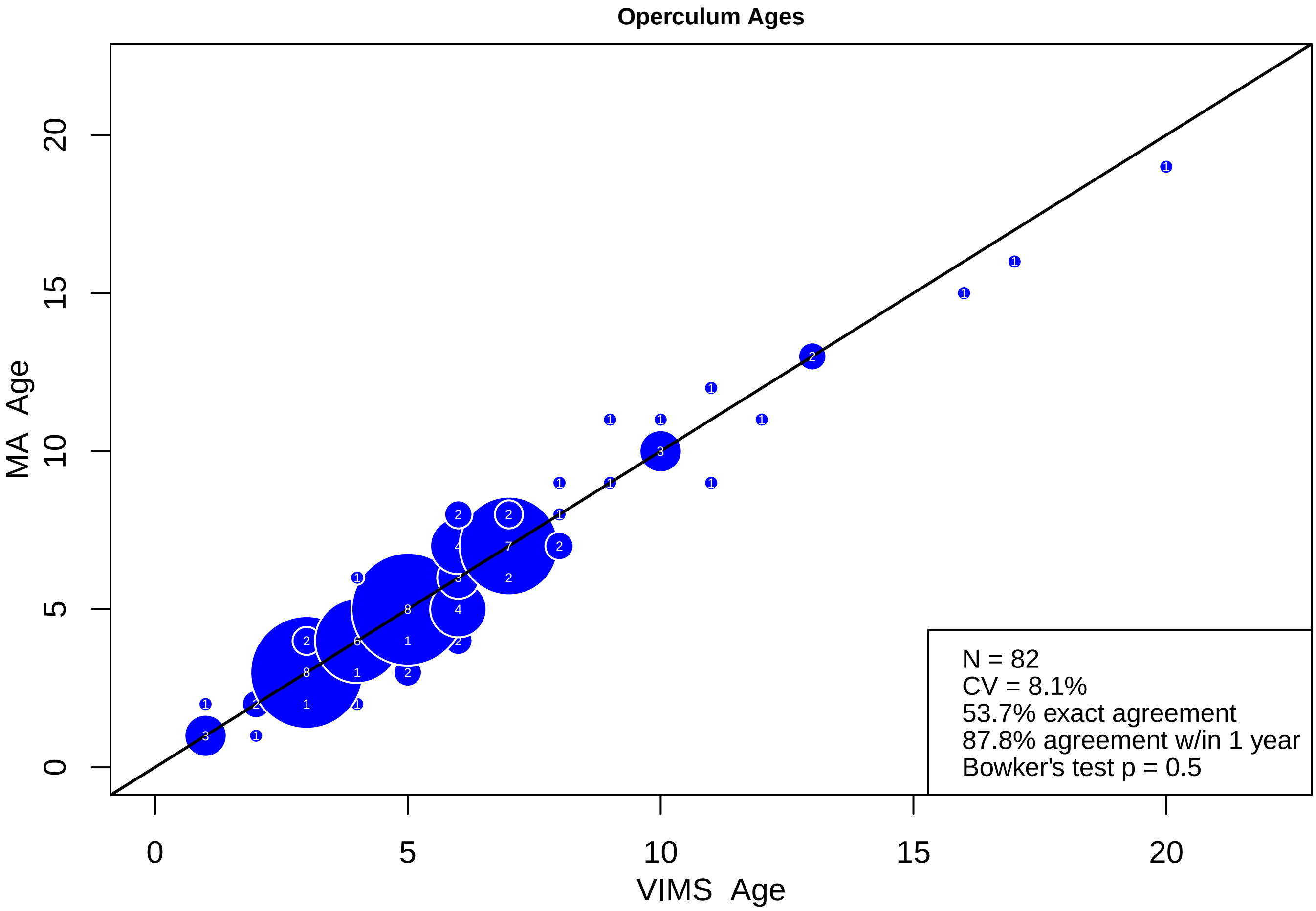


Figure 23: RI vs. VIMS bias plots by hard part. Circles are proportional to number of observations.



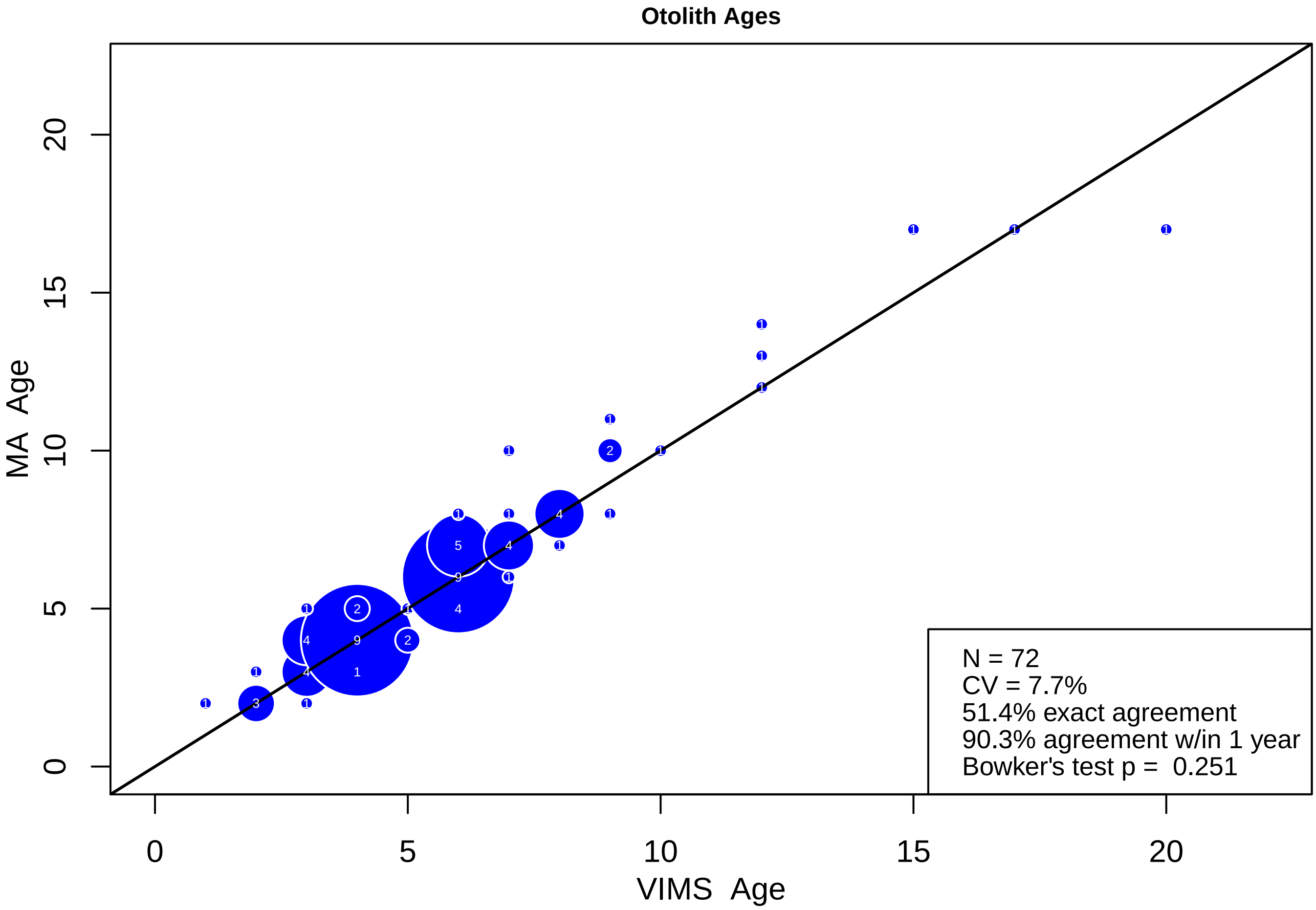


Figure 24: MA vs. VIMS bias plots by hard part. Circles are proportional to number of observations.

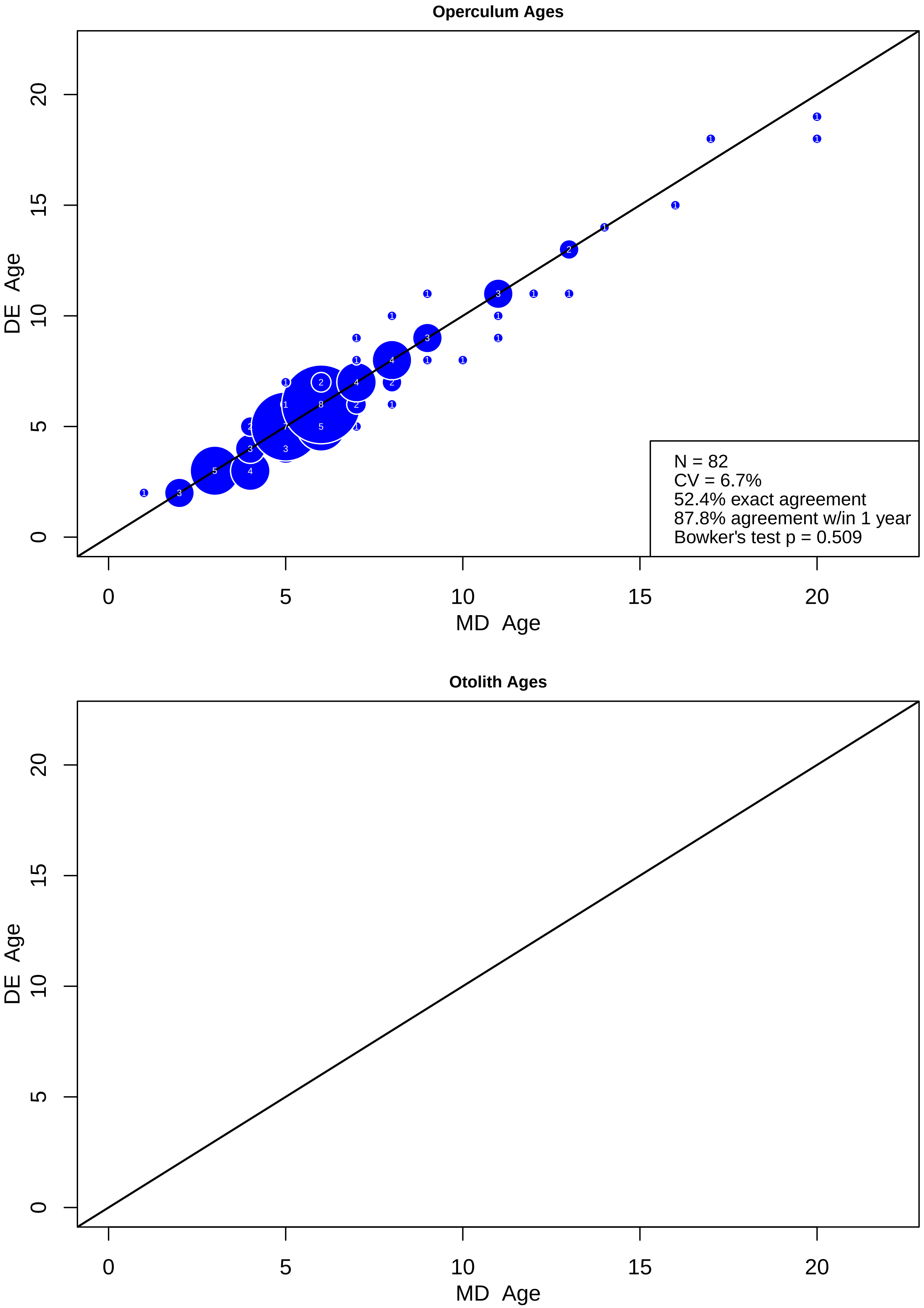
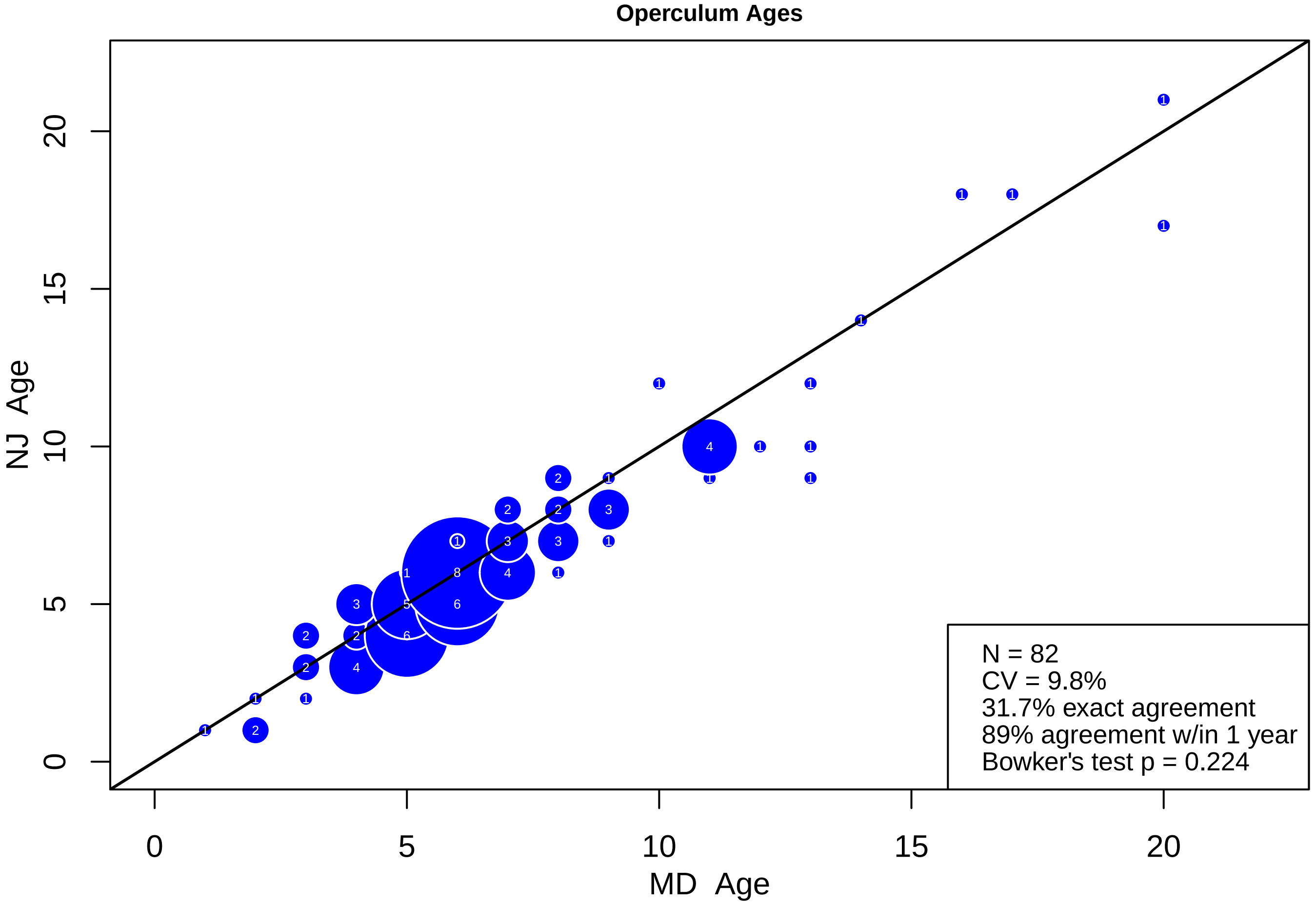


Figure 25: DE vs. MD bias plots by hard part. Circles are proportional to number of observations.



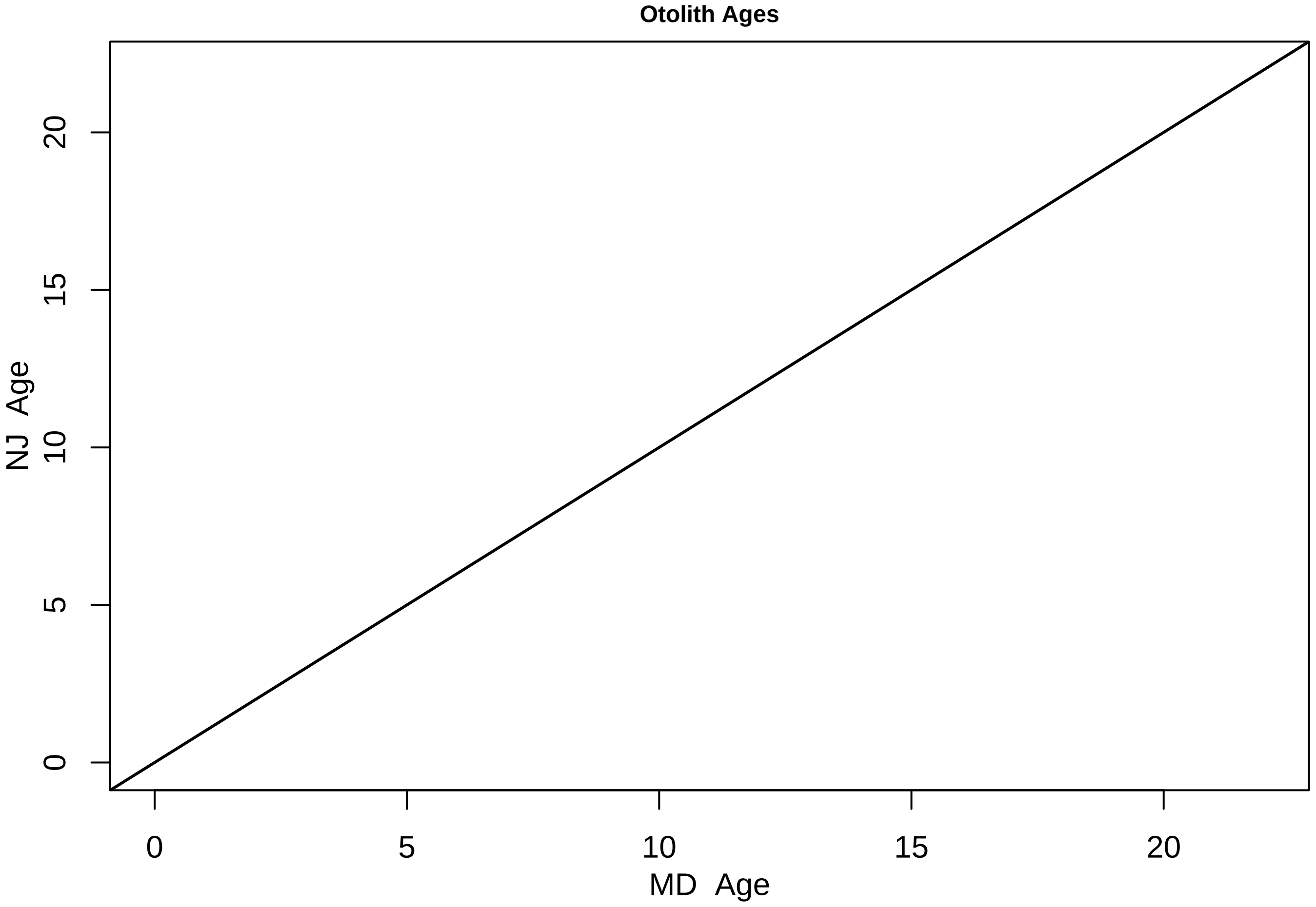
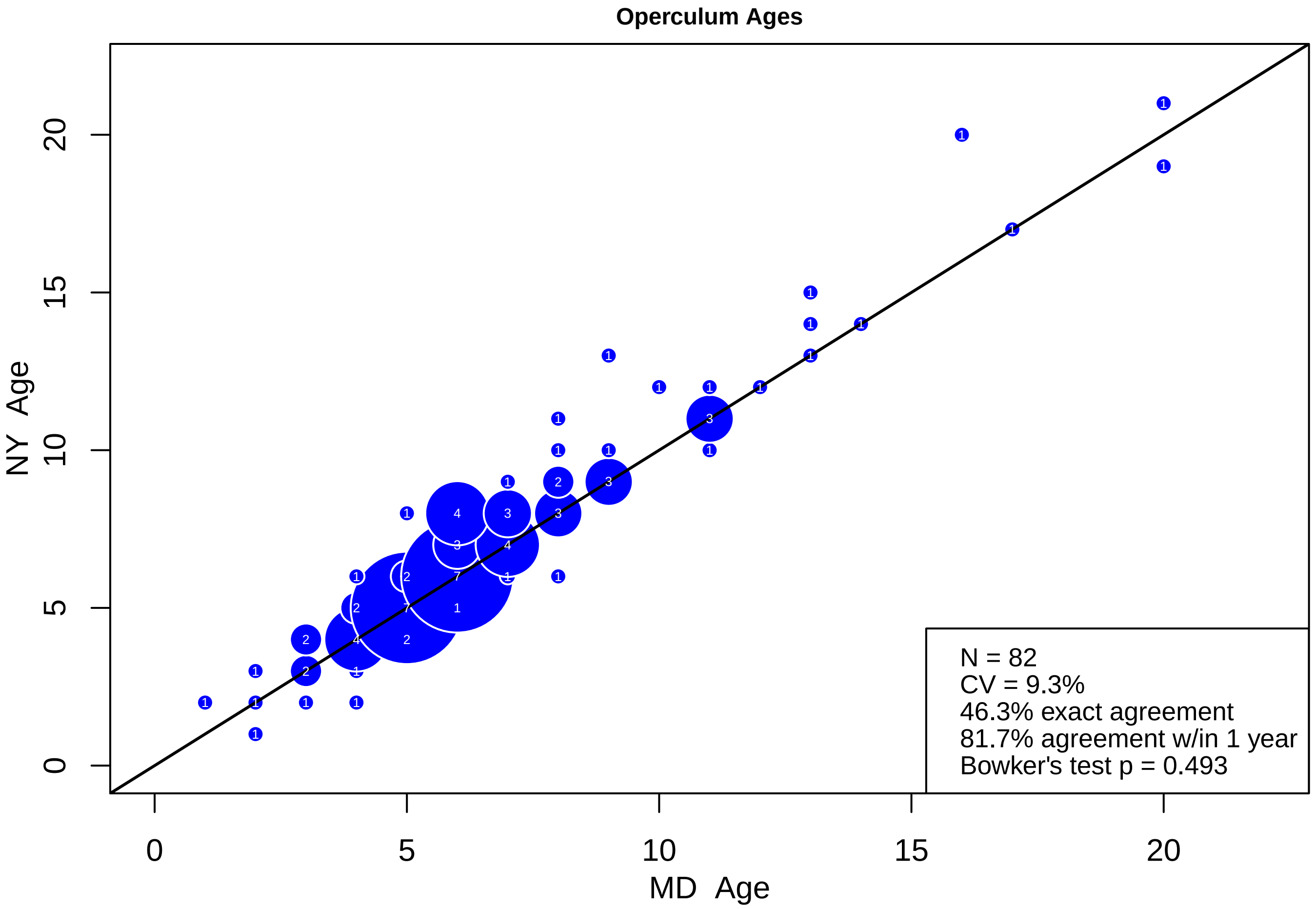


Figure 26: NJ vs. MD bias plots by hard part. Circles are proportional to number of observations.



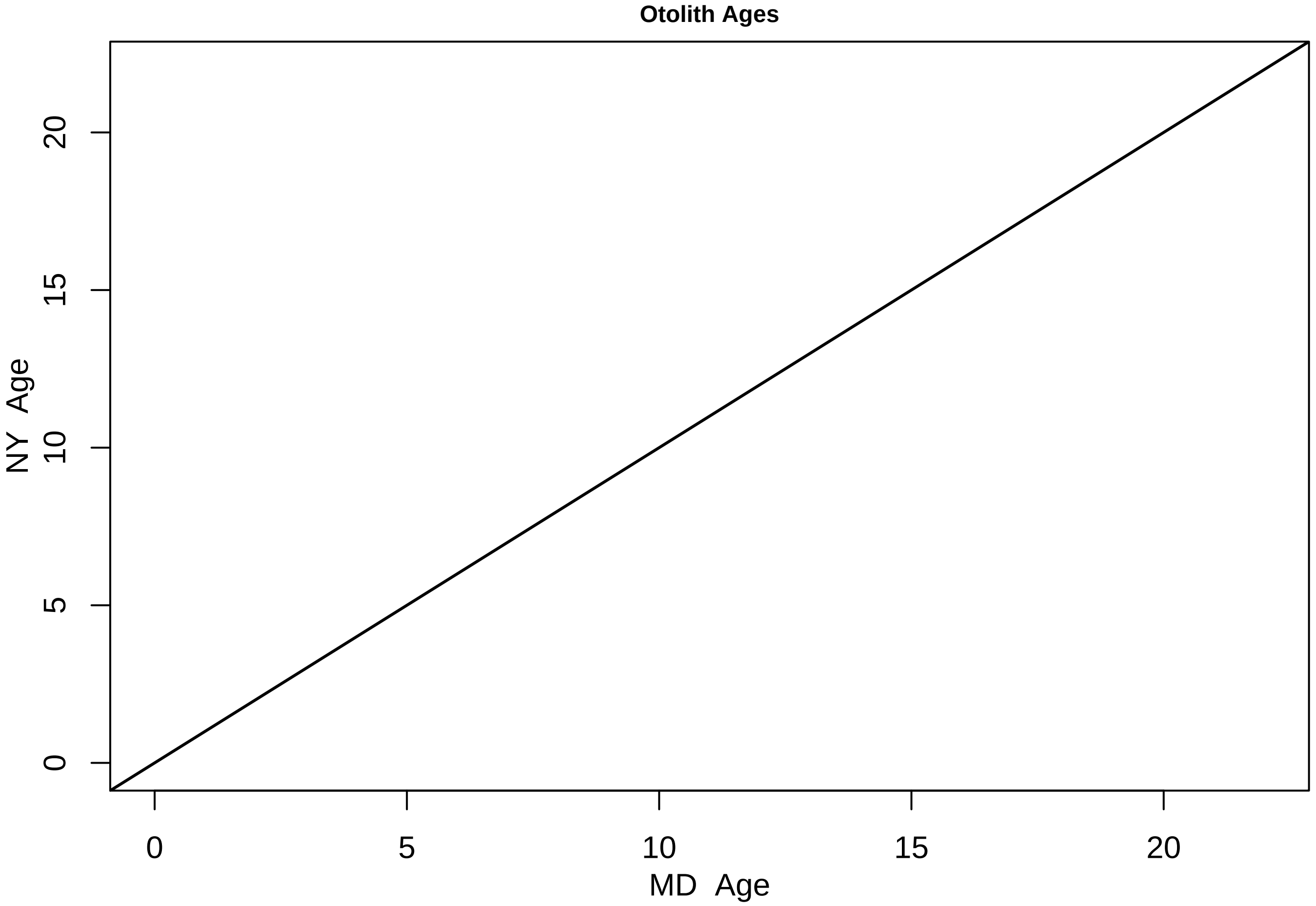
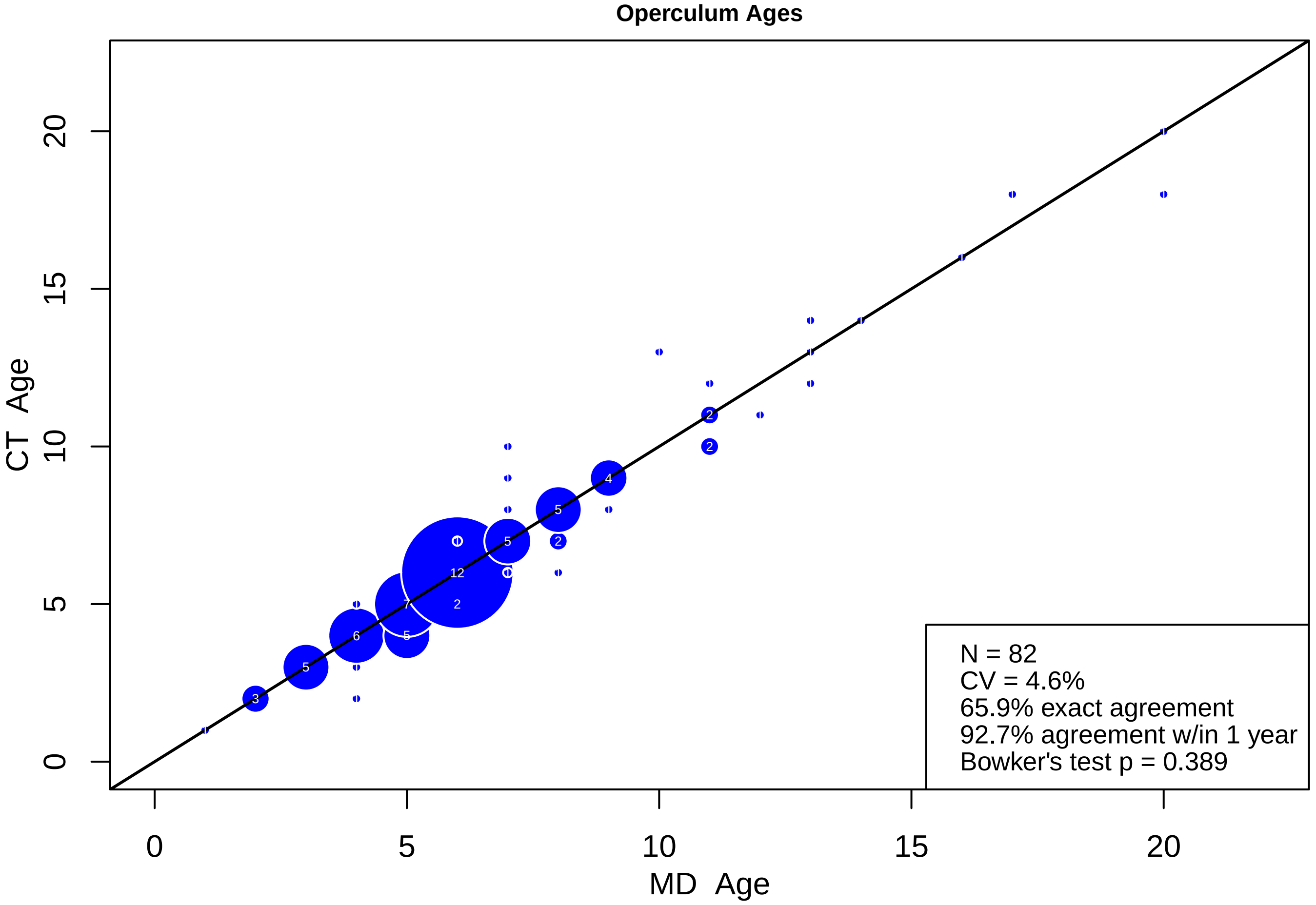


Figure 27: NY vs. MD bias plots by hard part. Circles are proportional to number of observations.



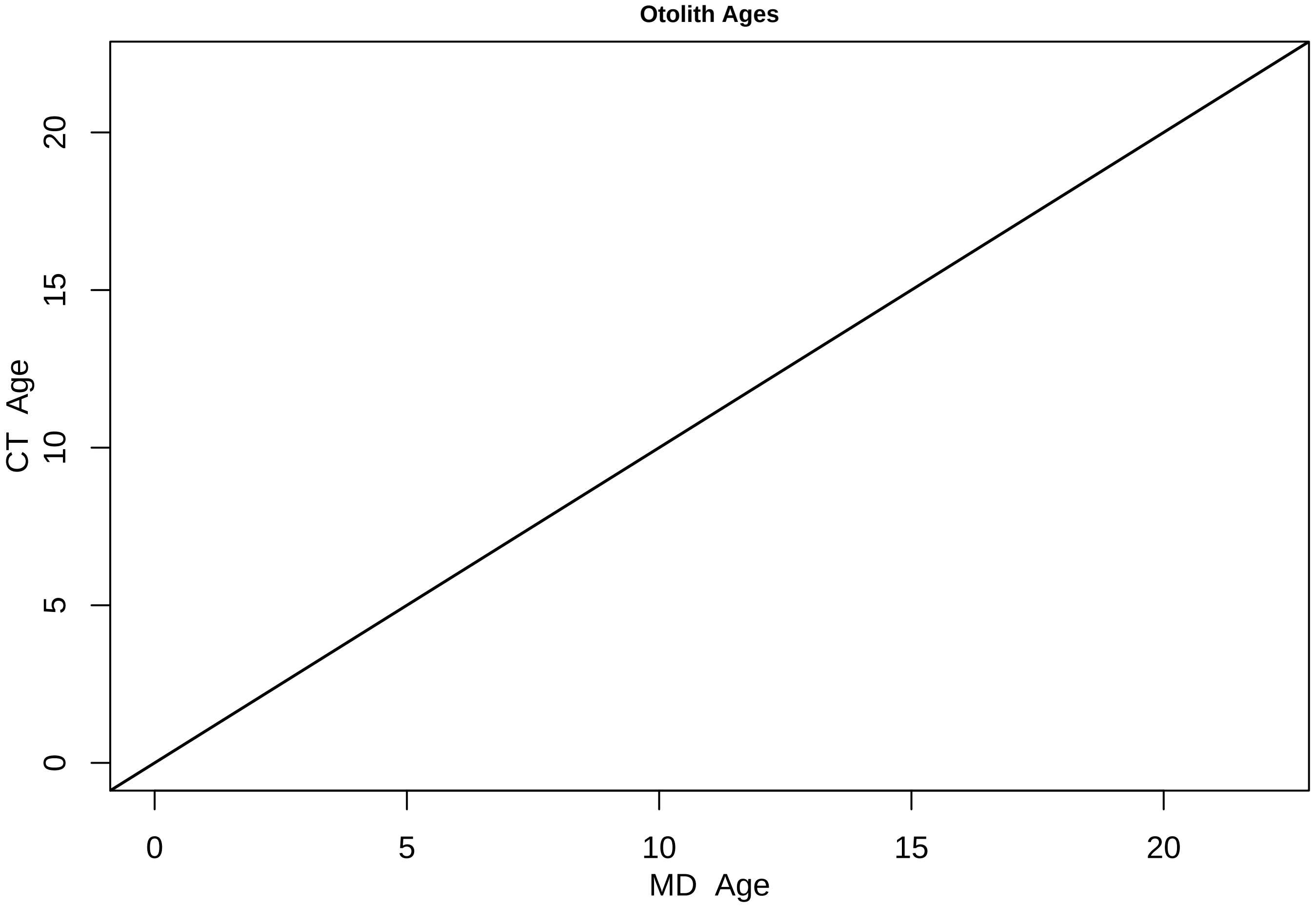
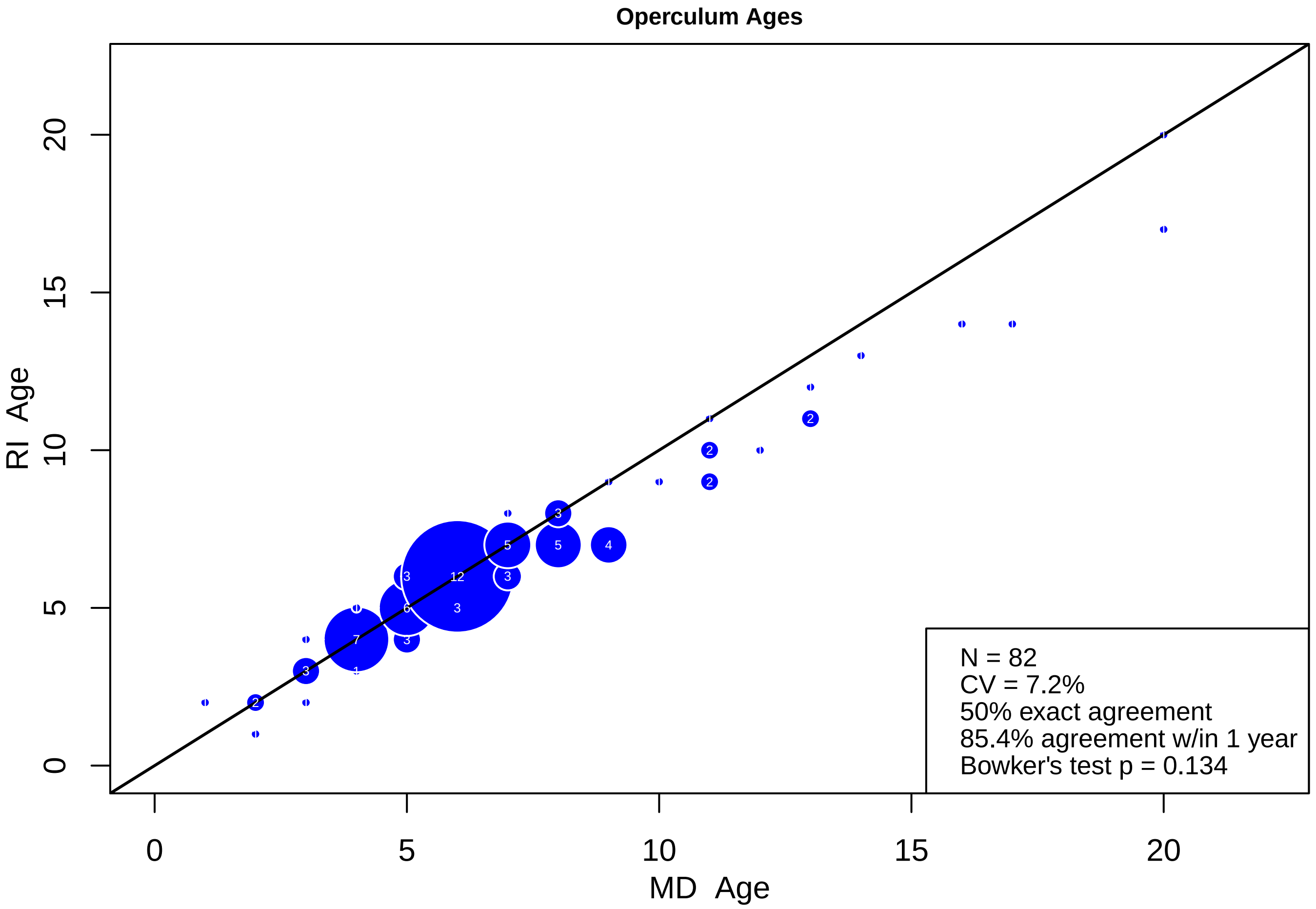


Figure 28: CT vs. MD bias plots by hard part. Circles are proportional to number of observations.



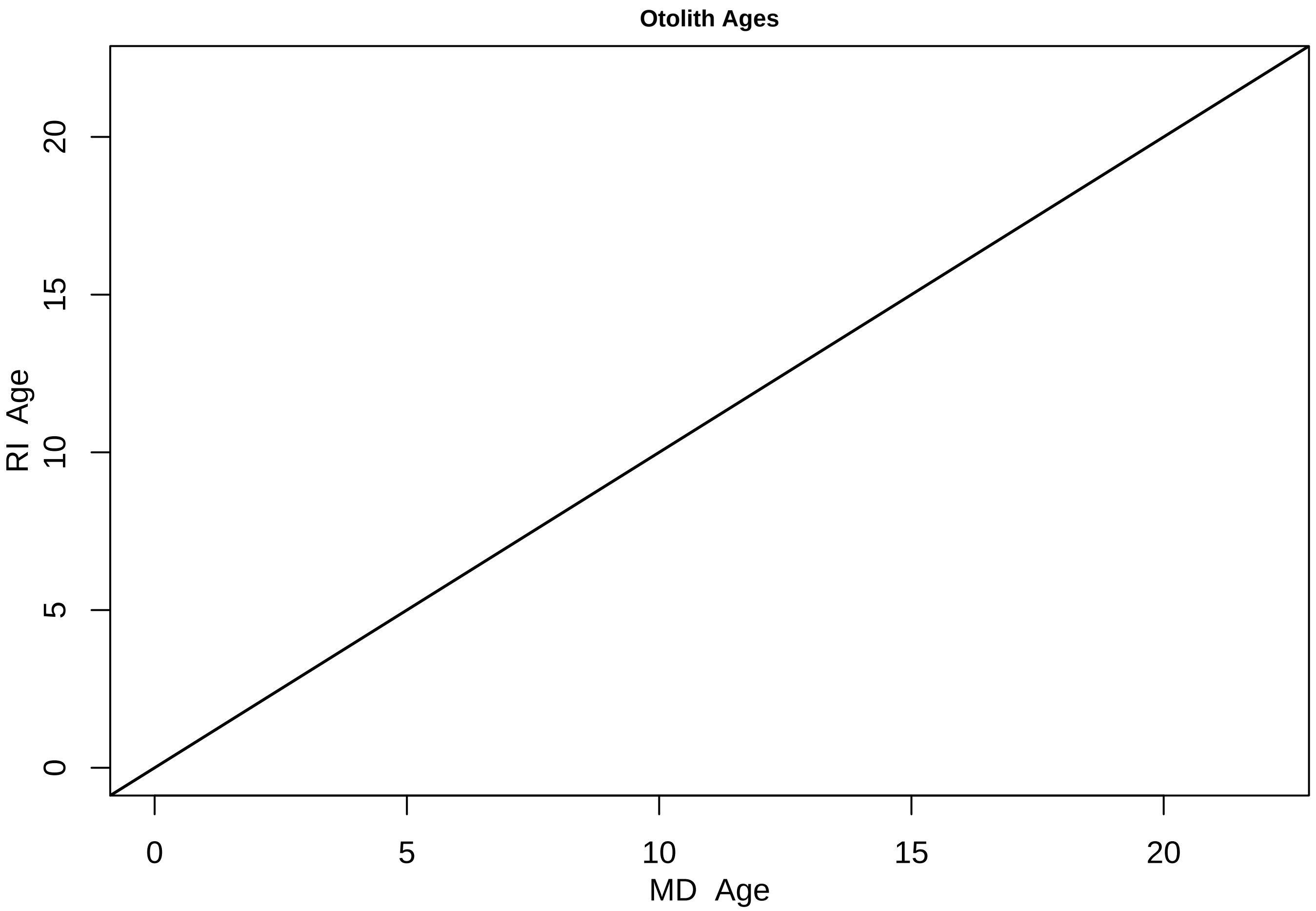
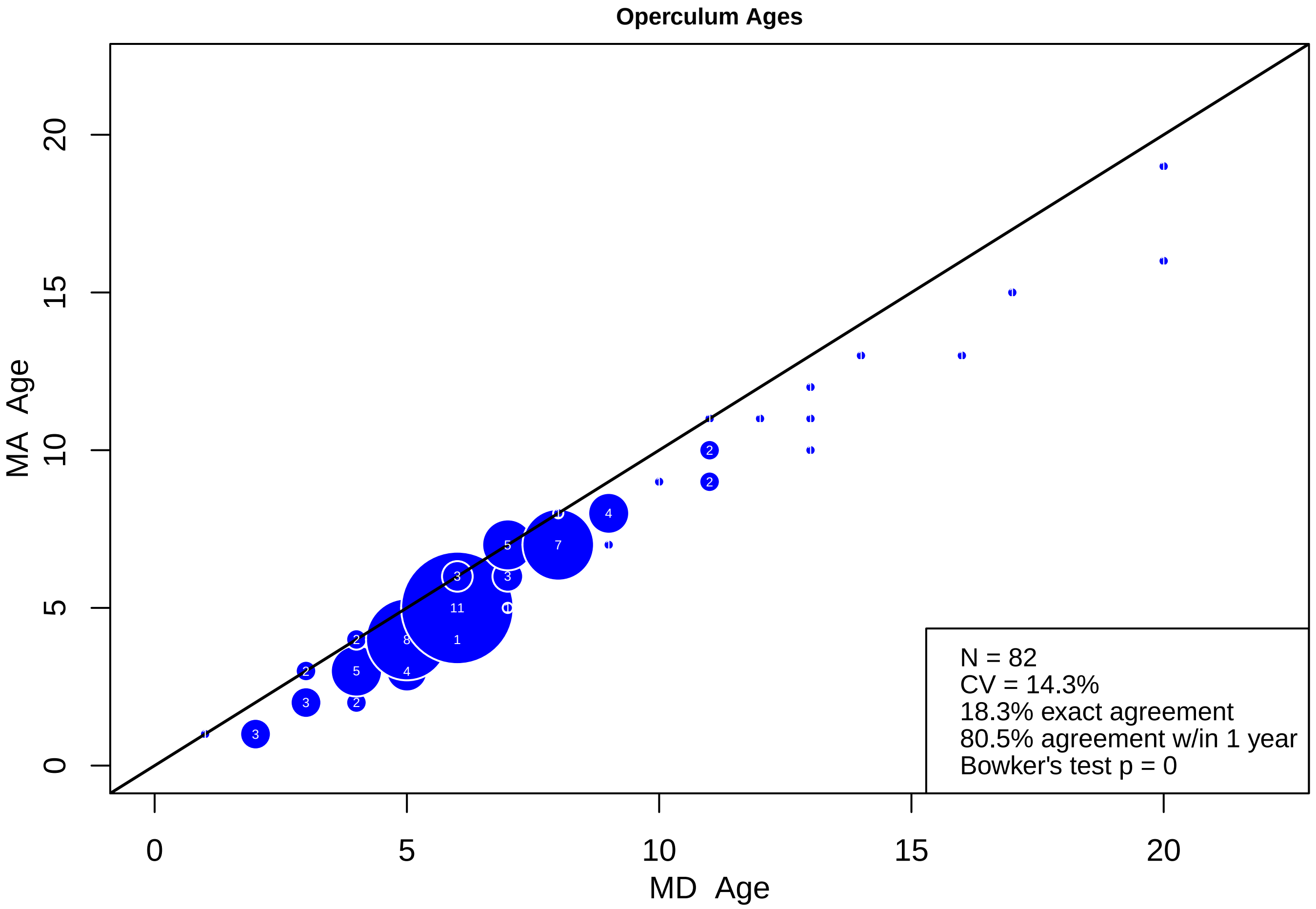


Figure 29: RI vs. MD bias plots by hard part. Circles are proportional to number of observations.



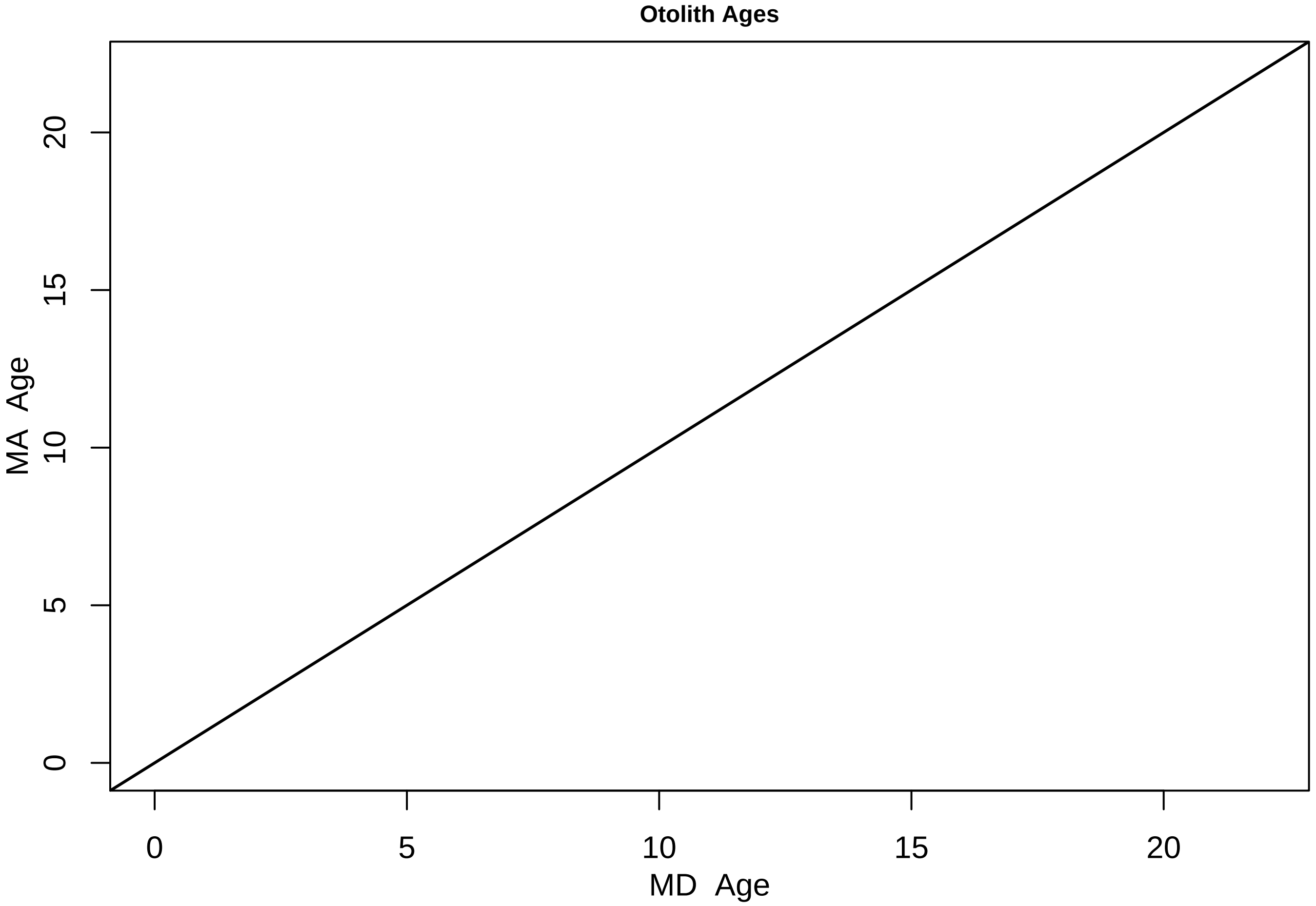
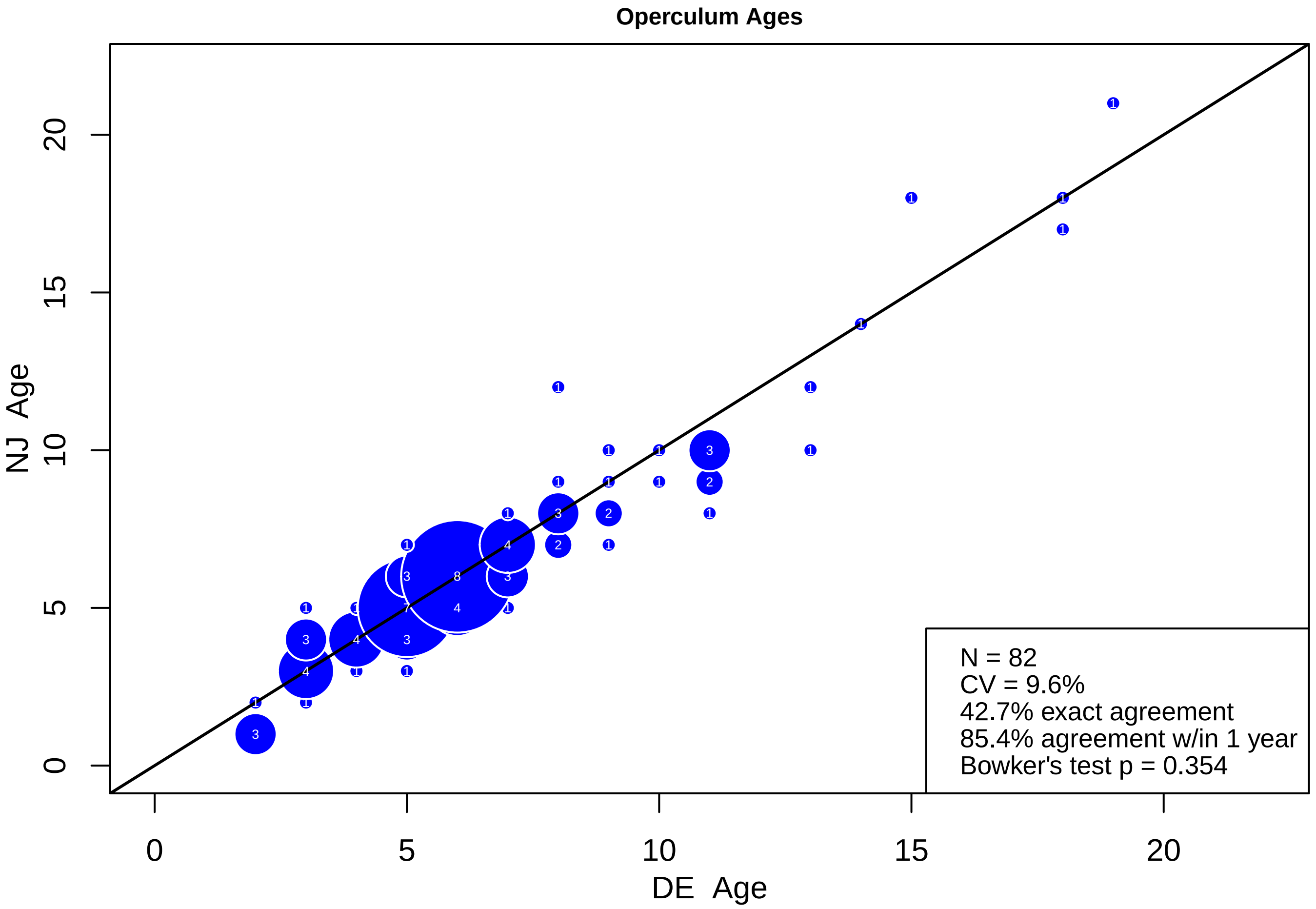


Figure 30: MA vs. MD bias plots by hard part. Circles are proportional to number of observations.



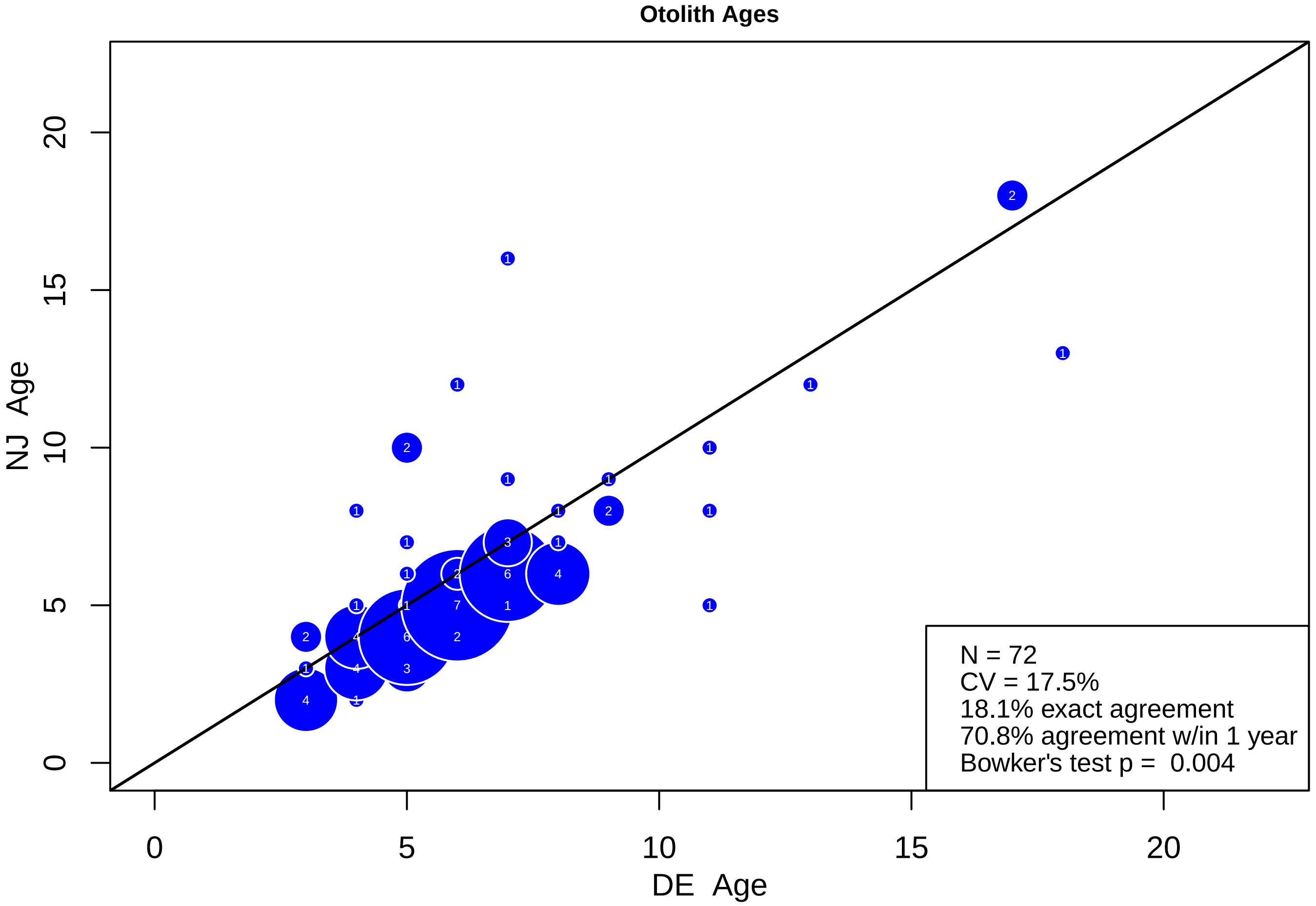
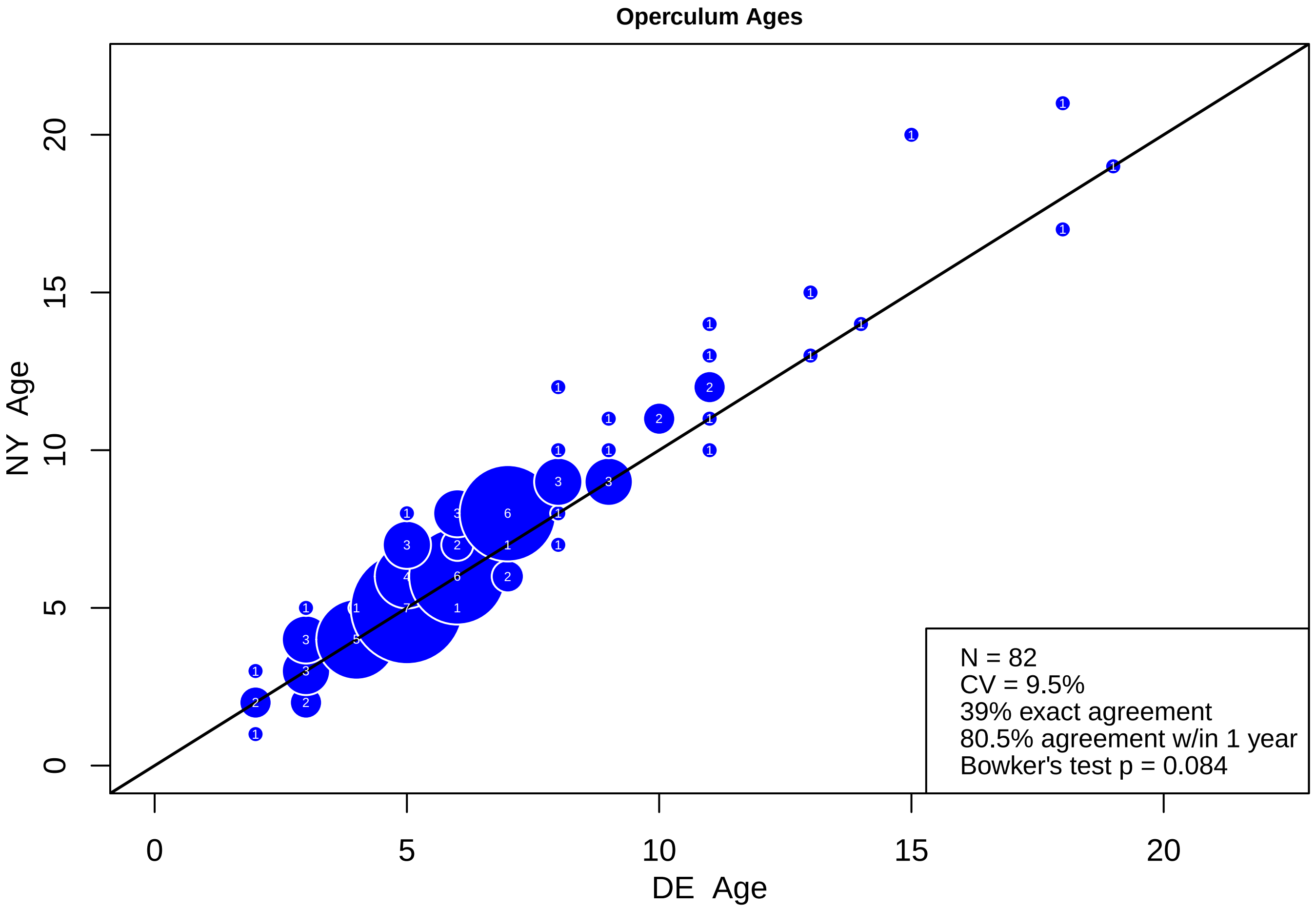


Figure 31: NJ vs. DE bias plots by hard part. Circles are proportional to number of observations.



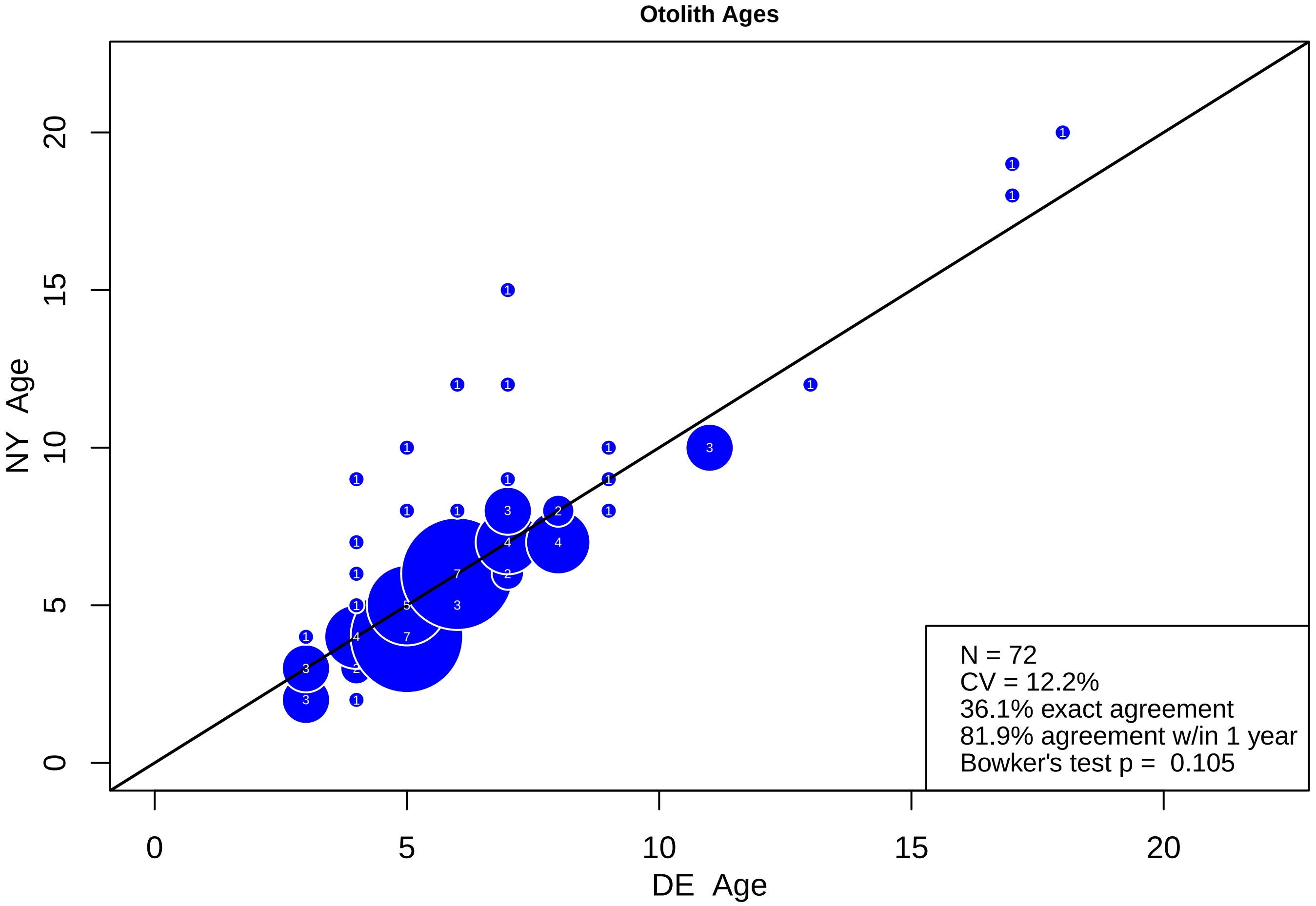
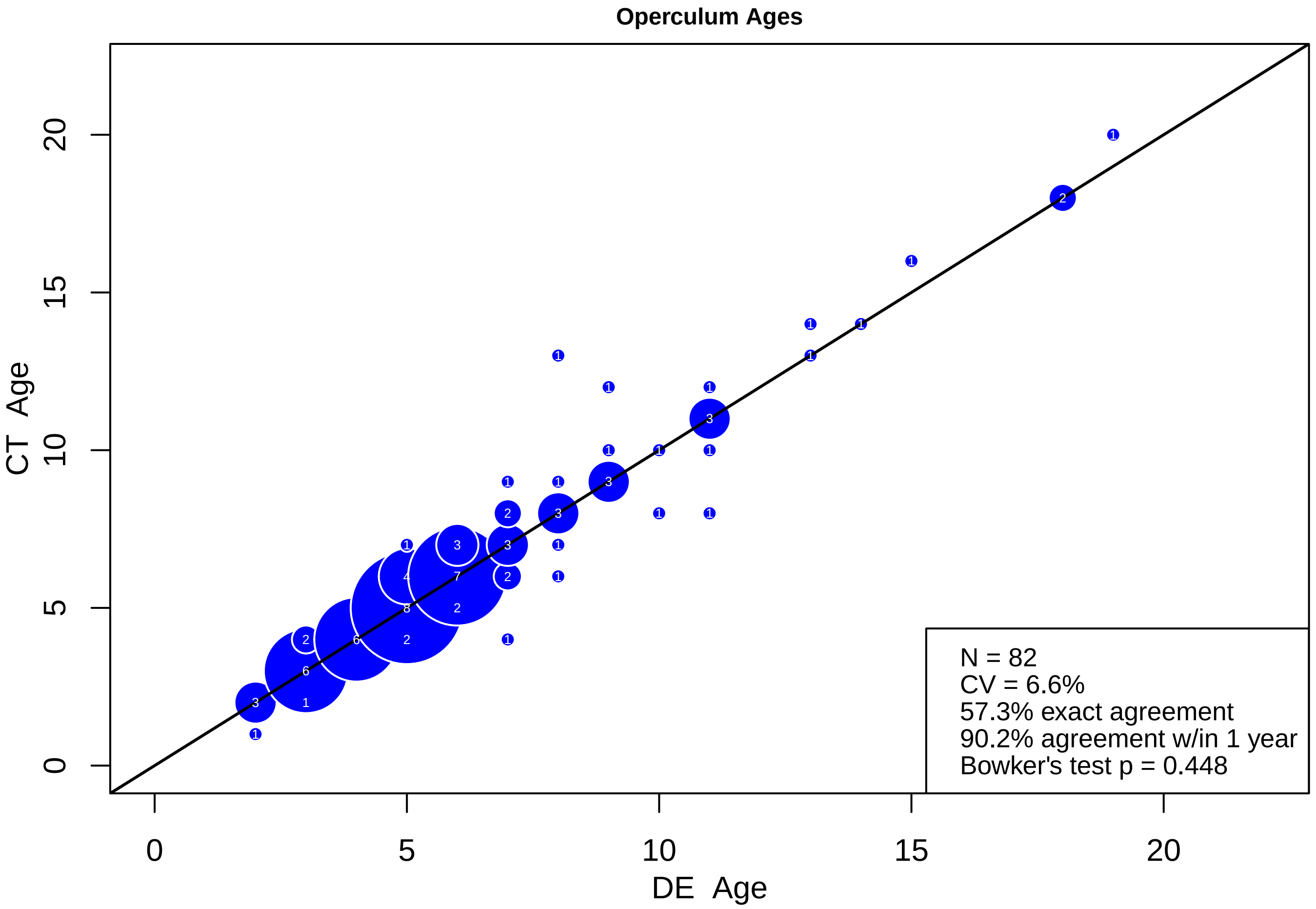


Figure 32: NY vs. DE bias plots by hard part. Circles are proportional to number of observations.



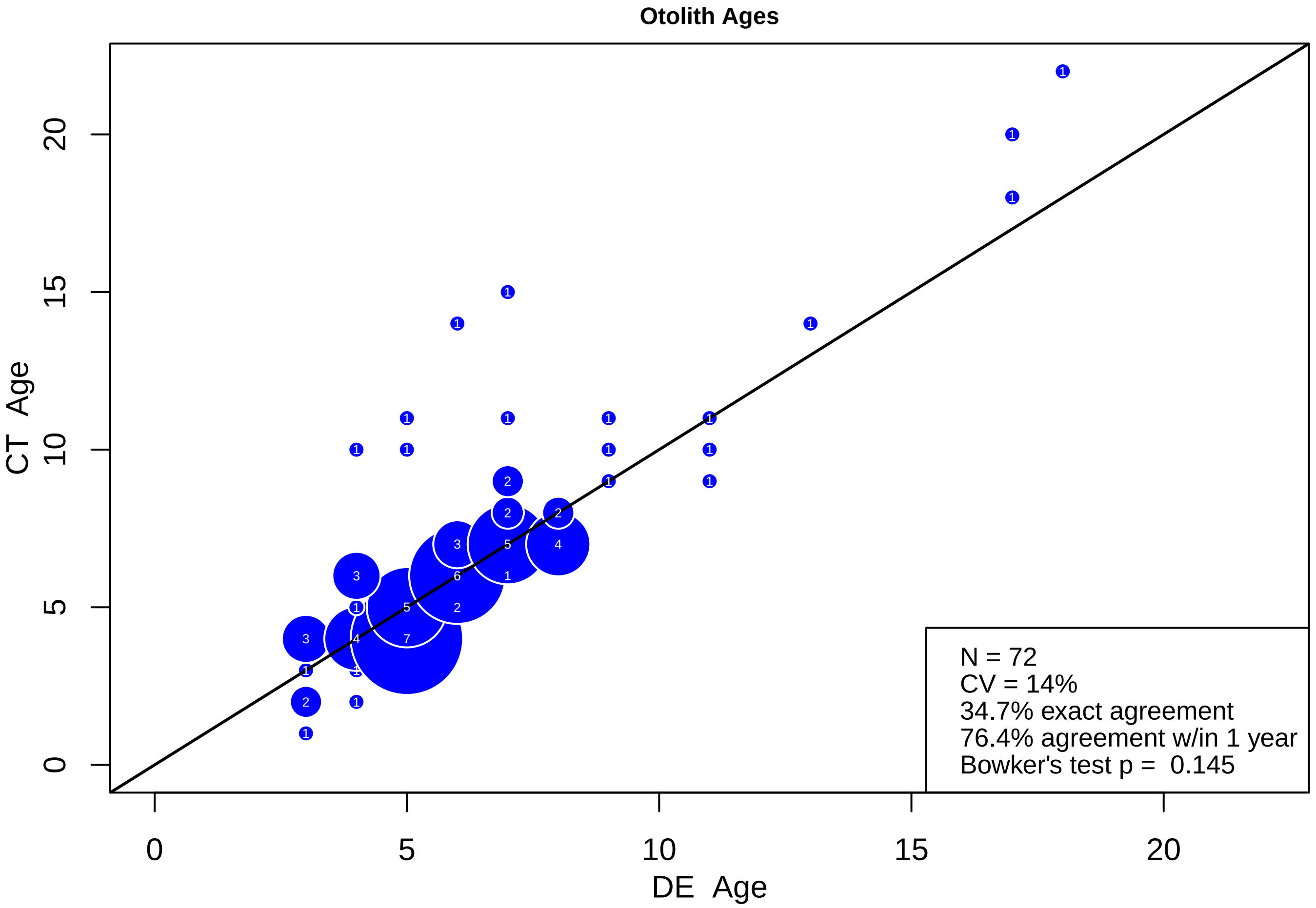
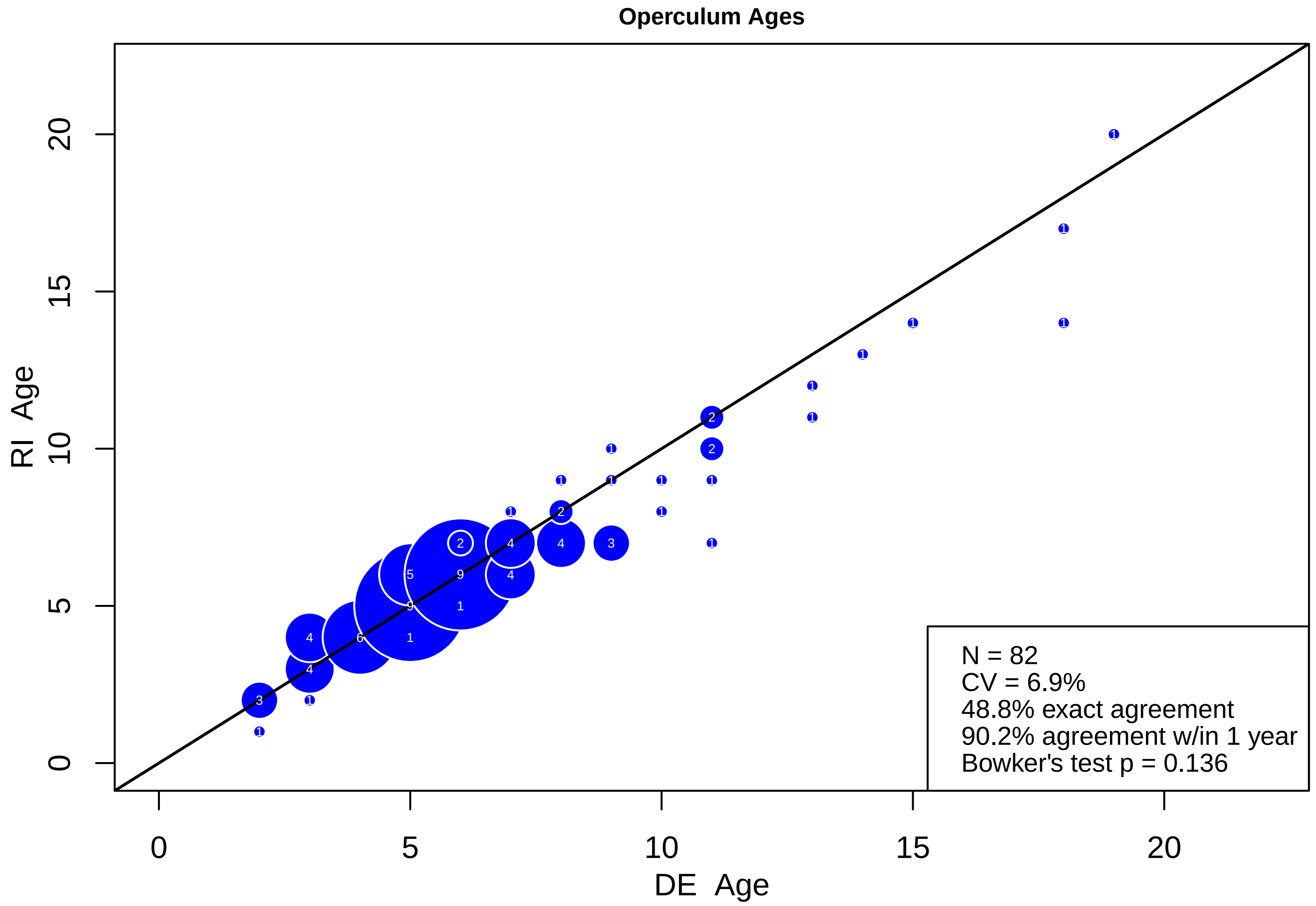


Figure 33: CT vs. DE bias plots by hard part. Circles are proportional to number of observations.



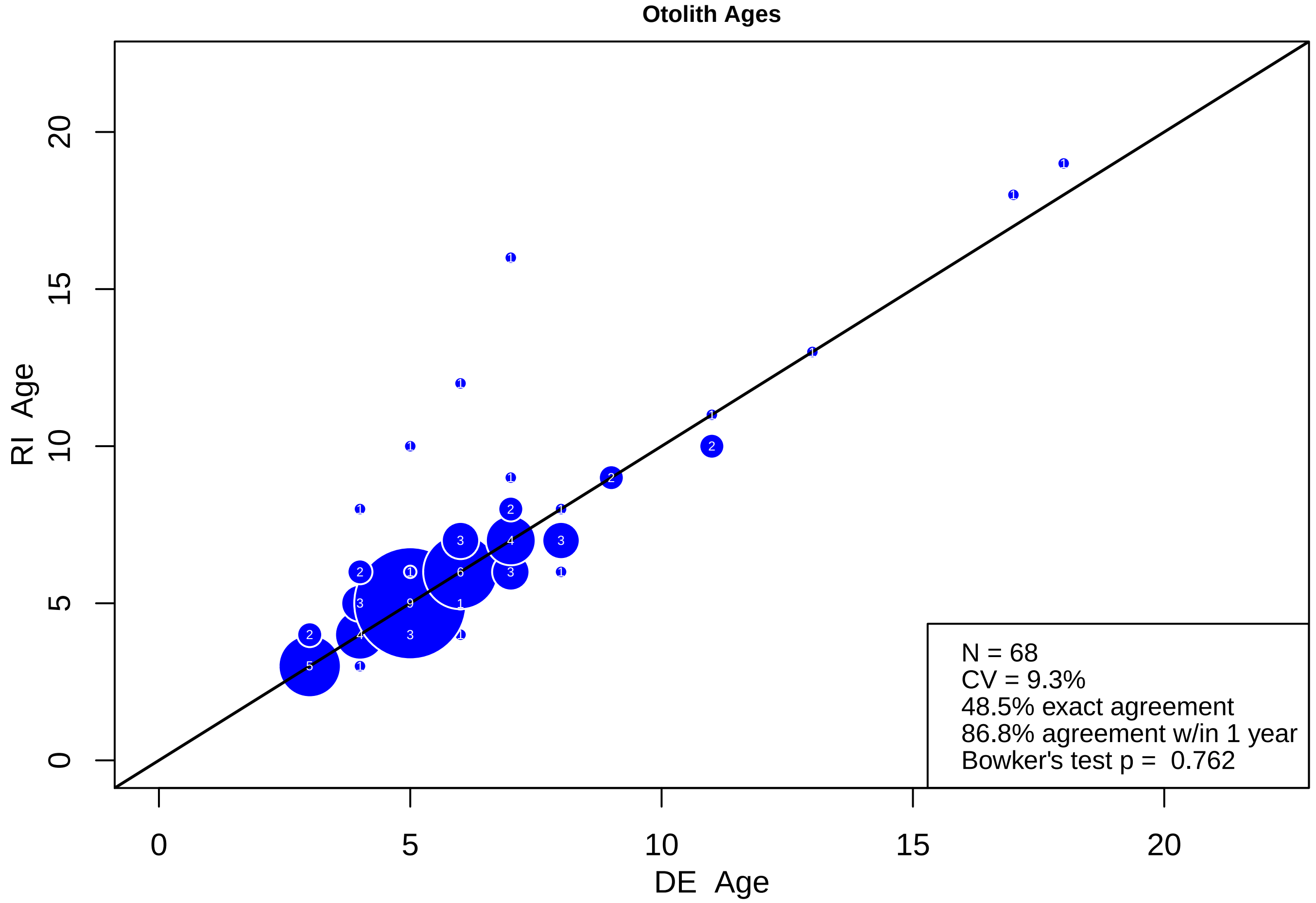
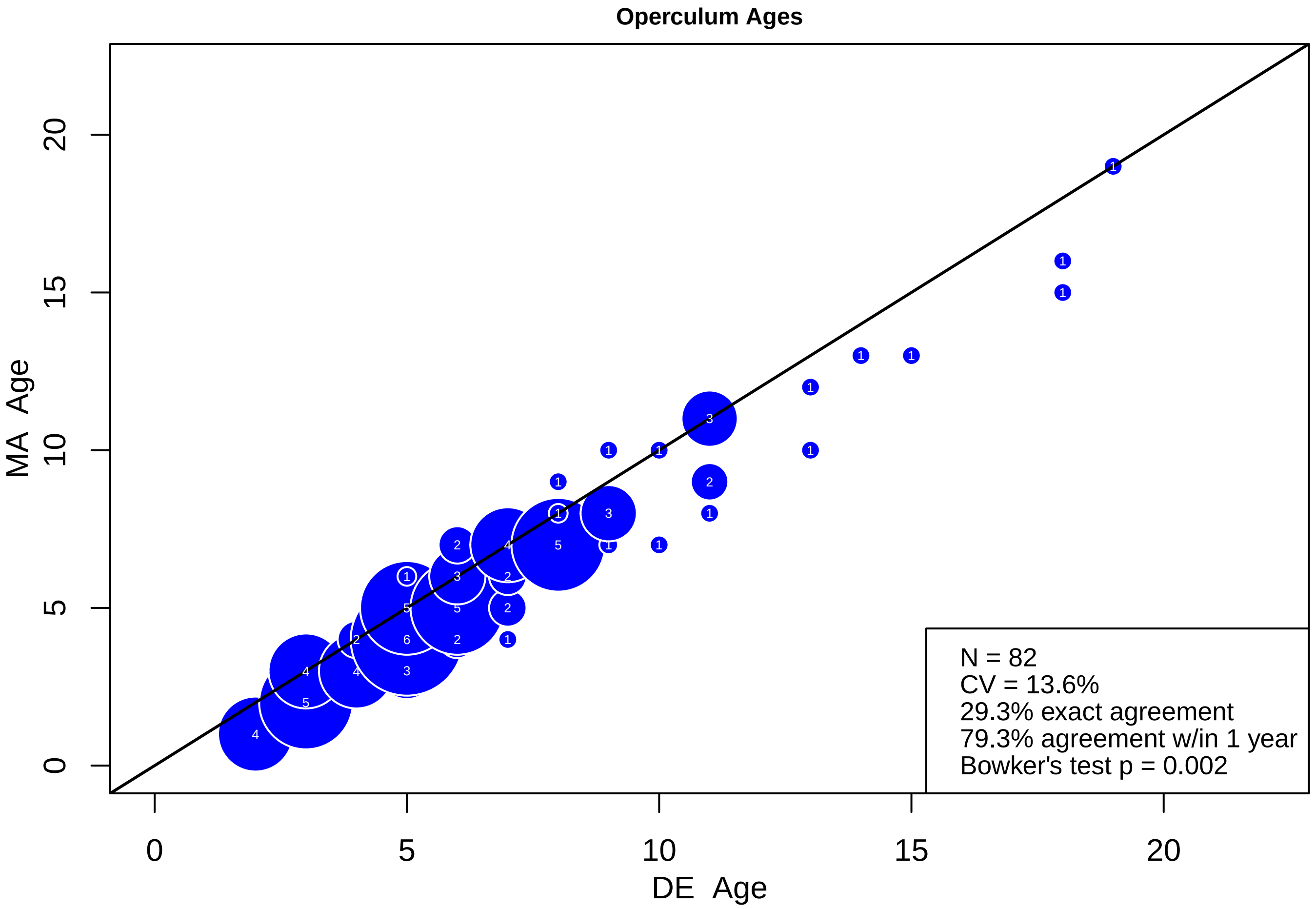


Figure 34: RI vs. DE bias plots by hard part. Circles are proportional to number of observations.



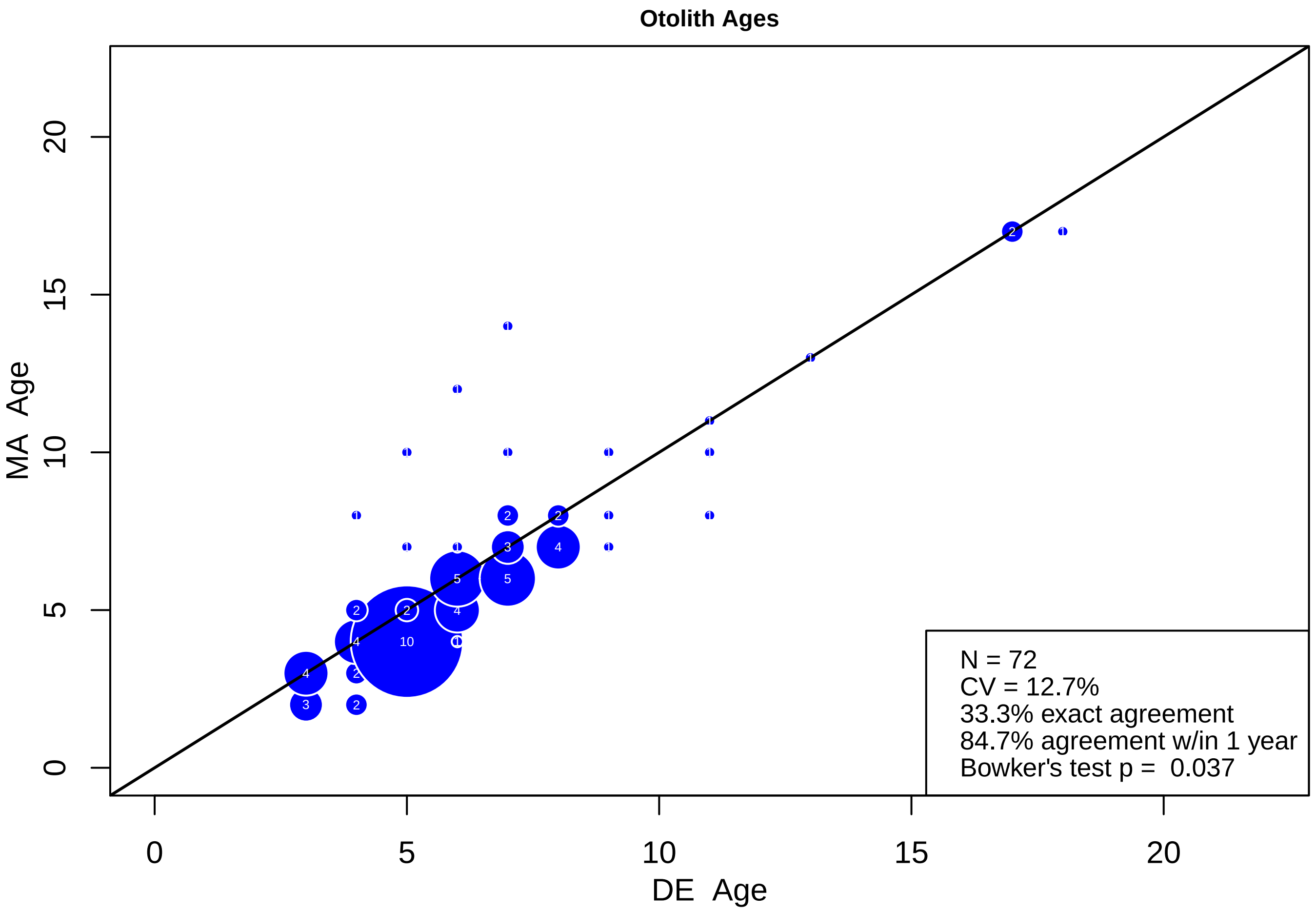
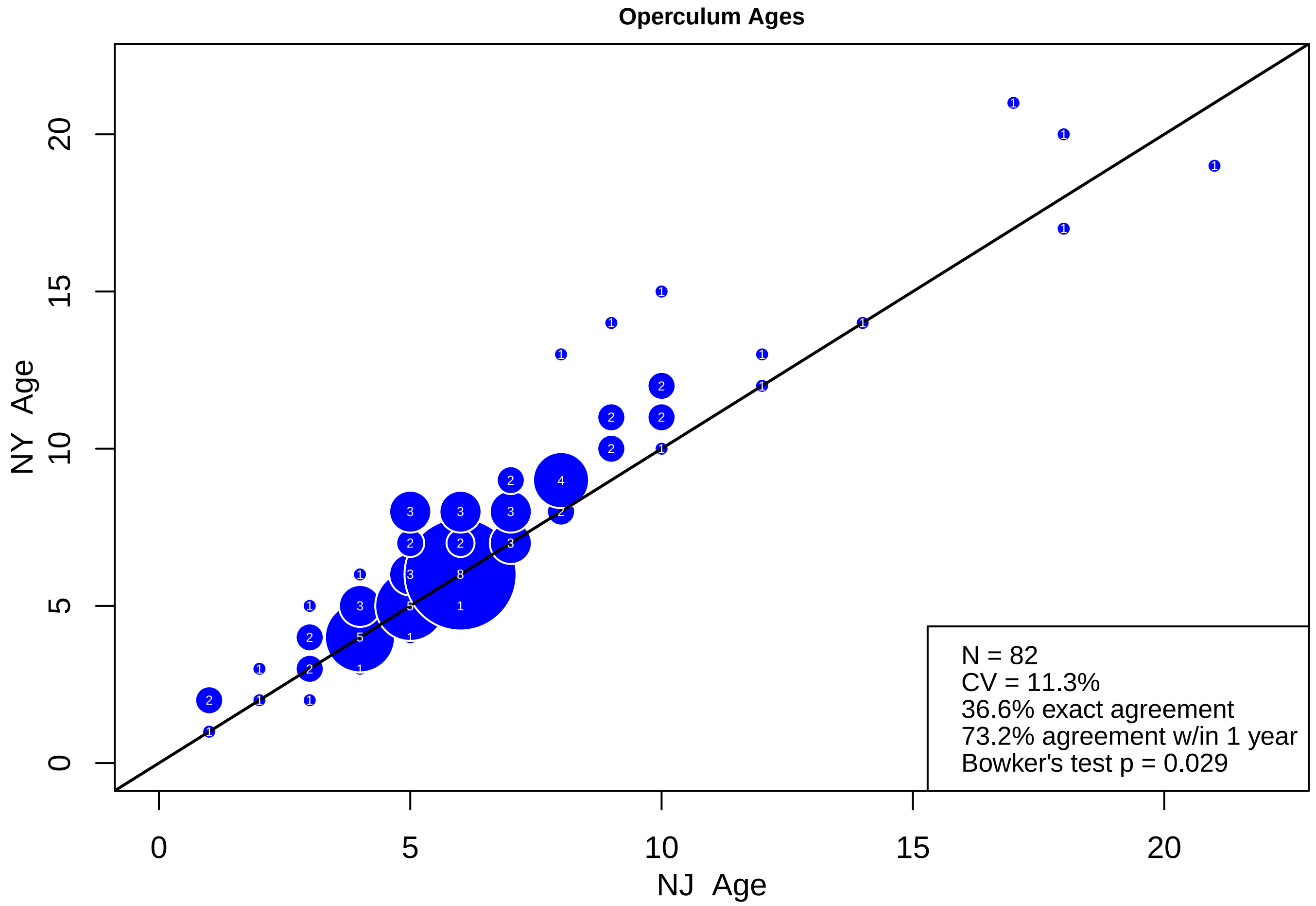


Figure 35: MA vs. DE bias plots by hard part. Circles are proportional to number of observations.



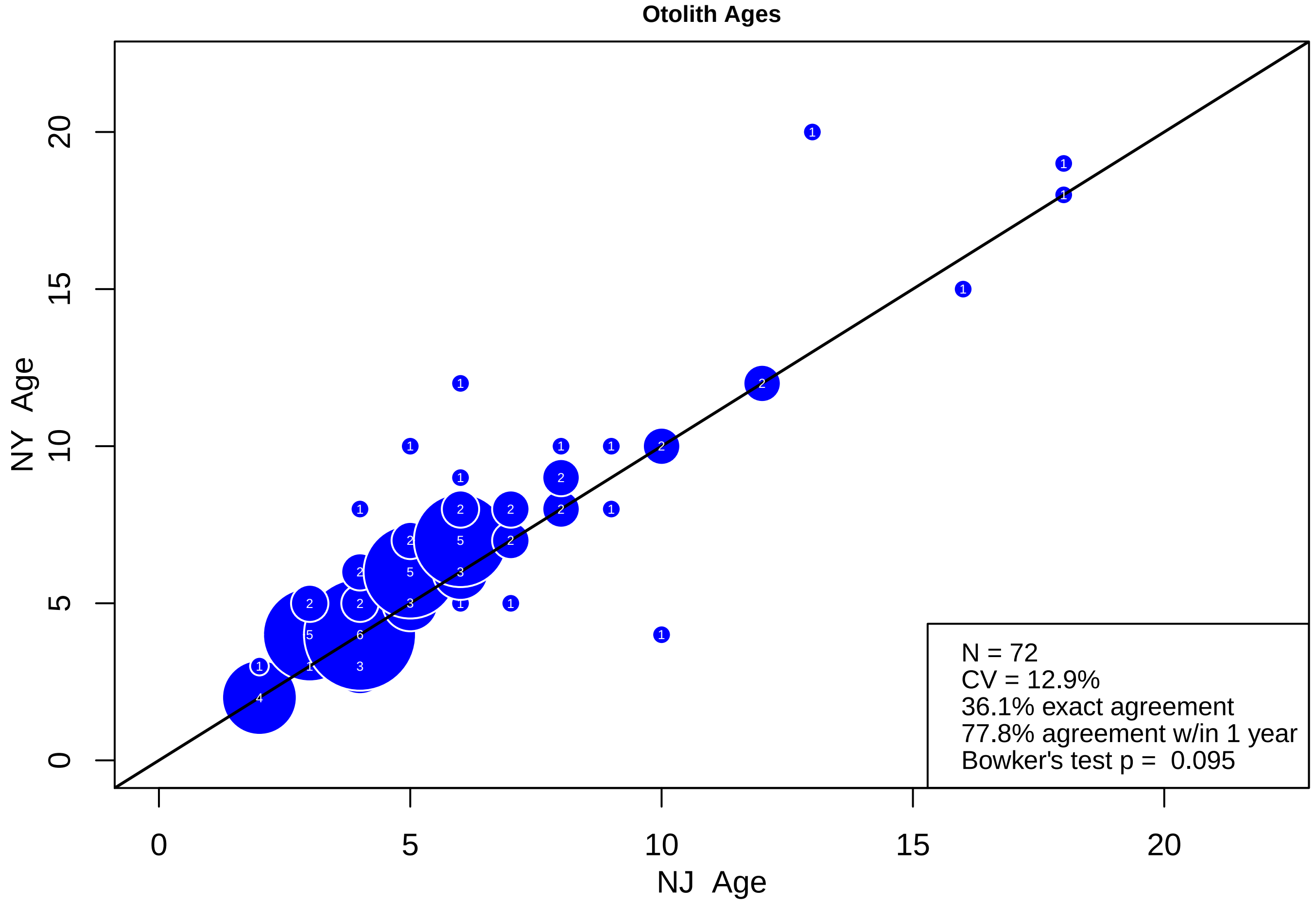
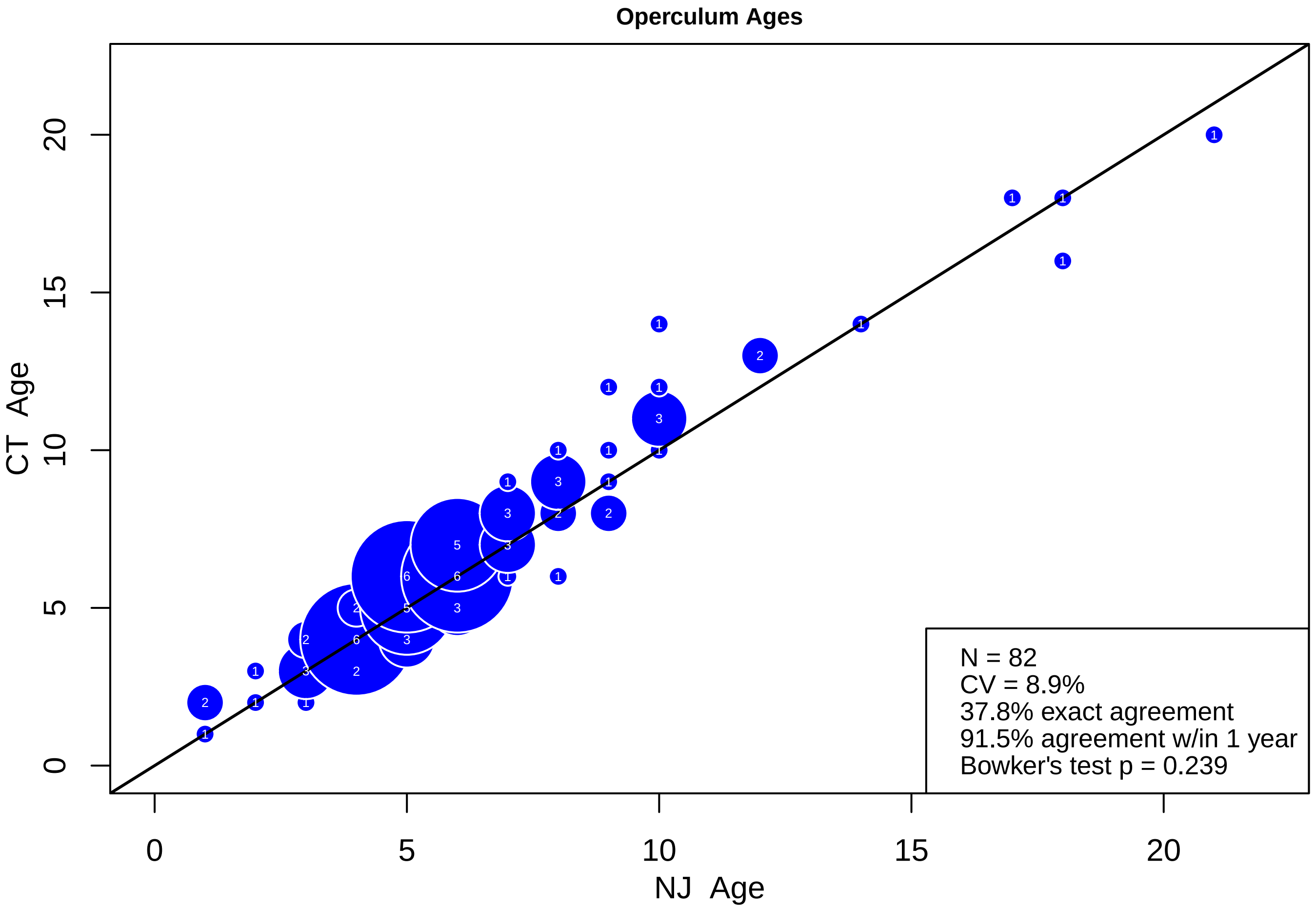


Figure 36: NY vs. NJ bias plots by hard part. Circles are proportional to number of observations.



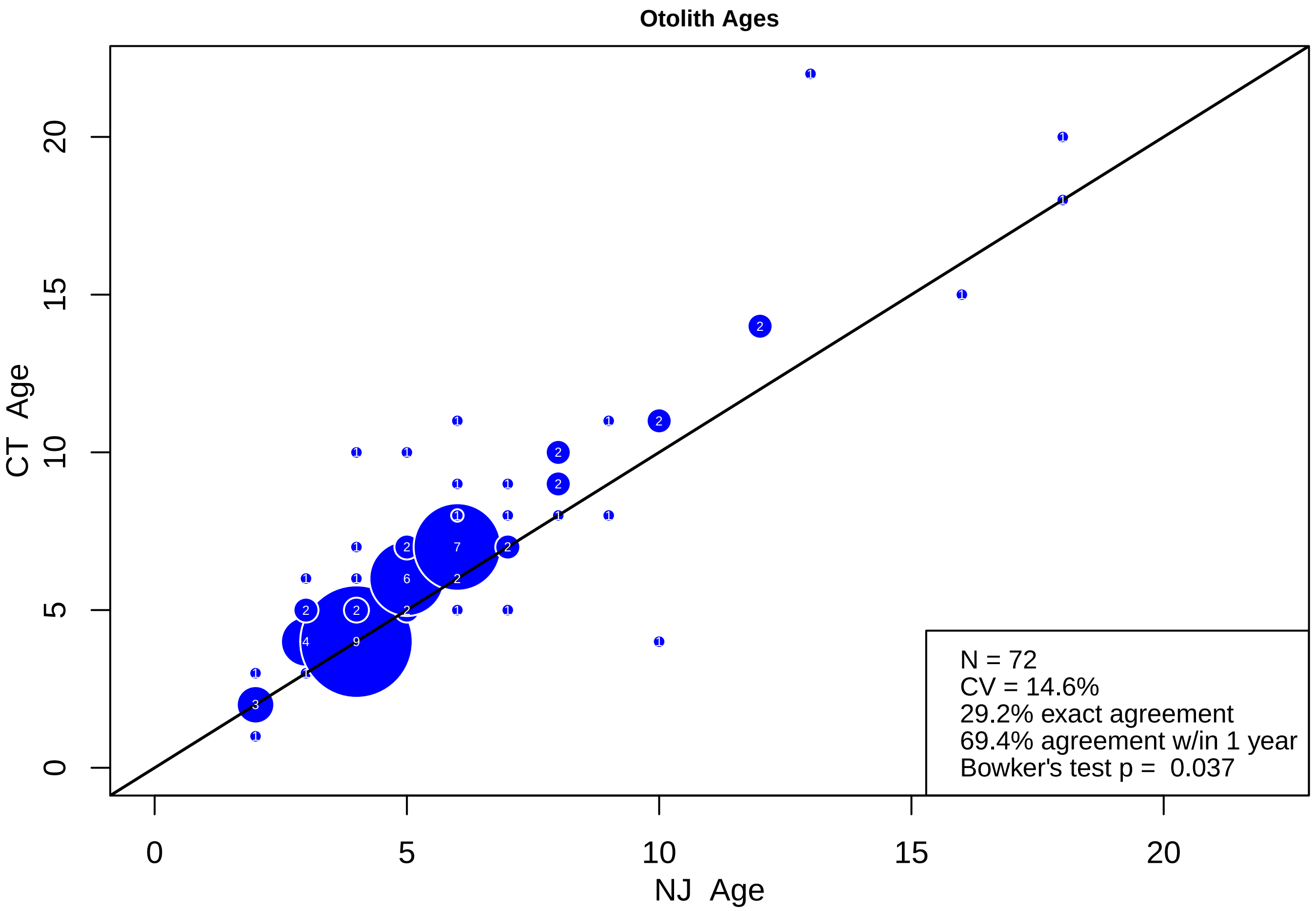
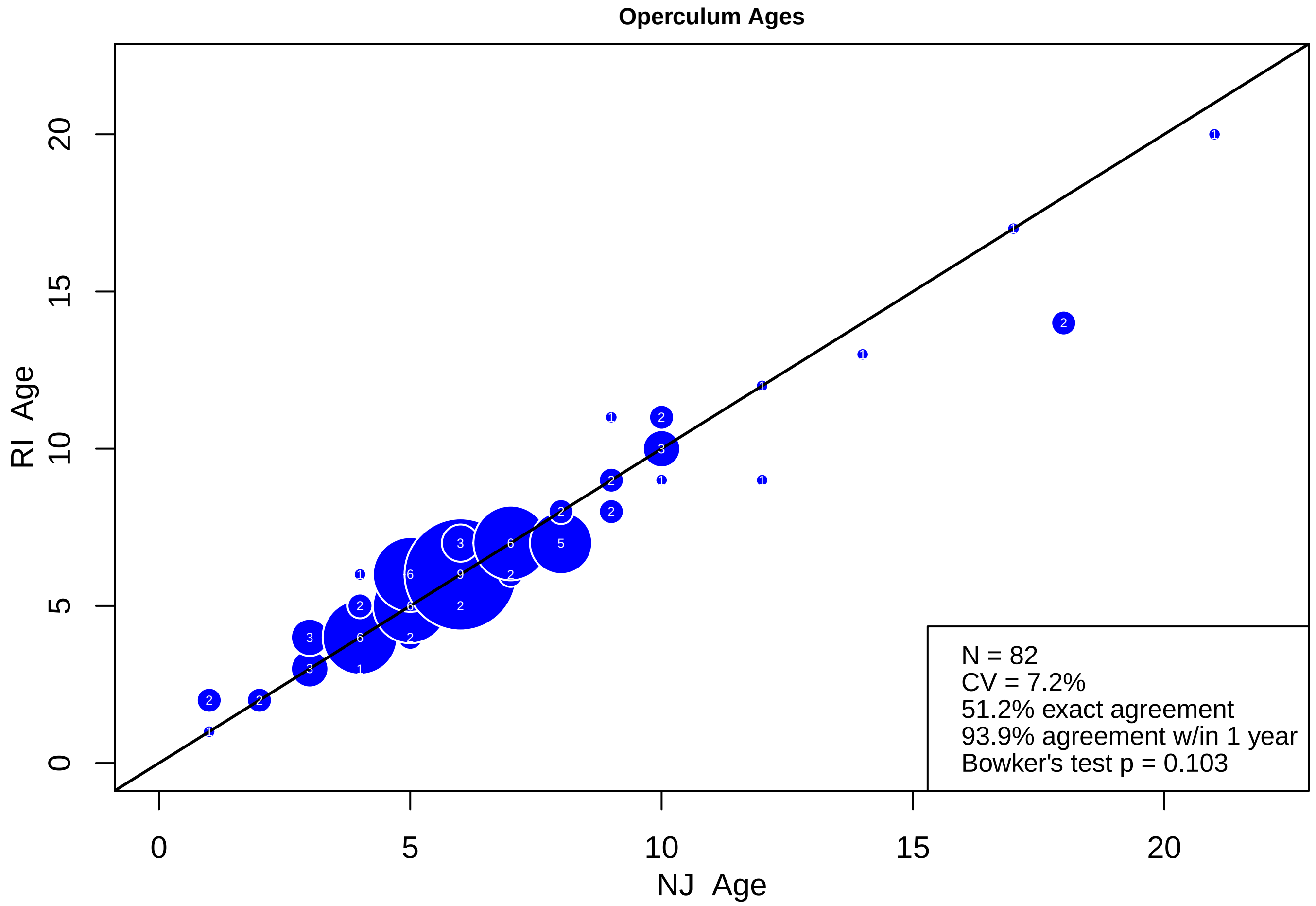


Figure 37: CT vs. NJ bias plots by hard part. Circles are proportional to number of observations.



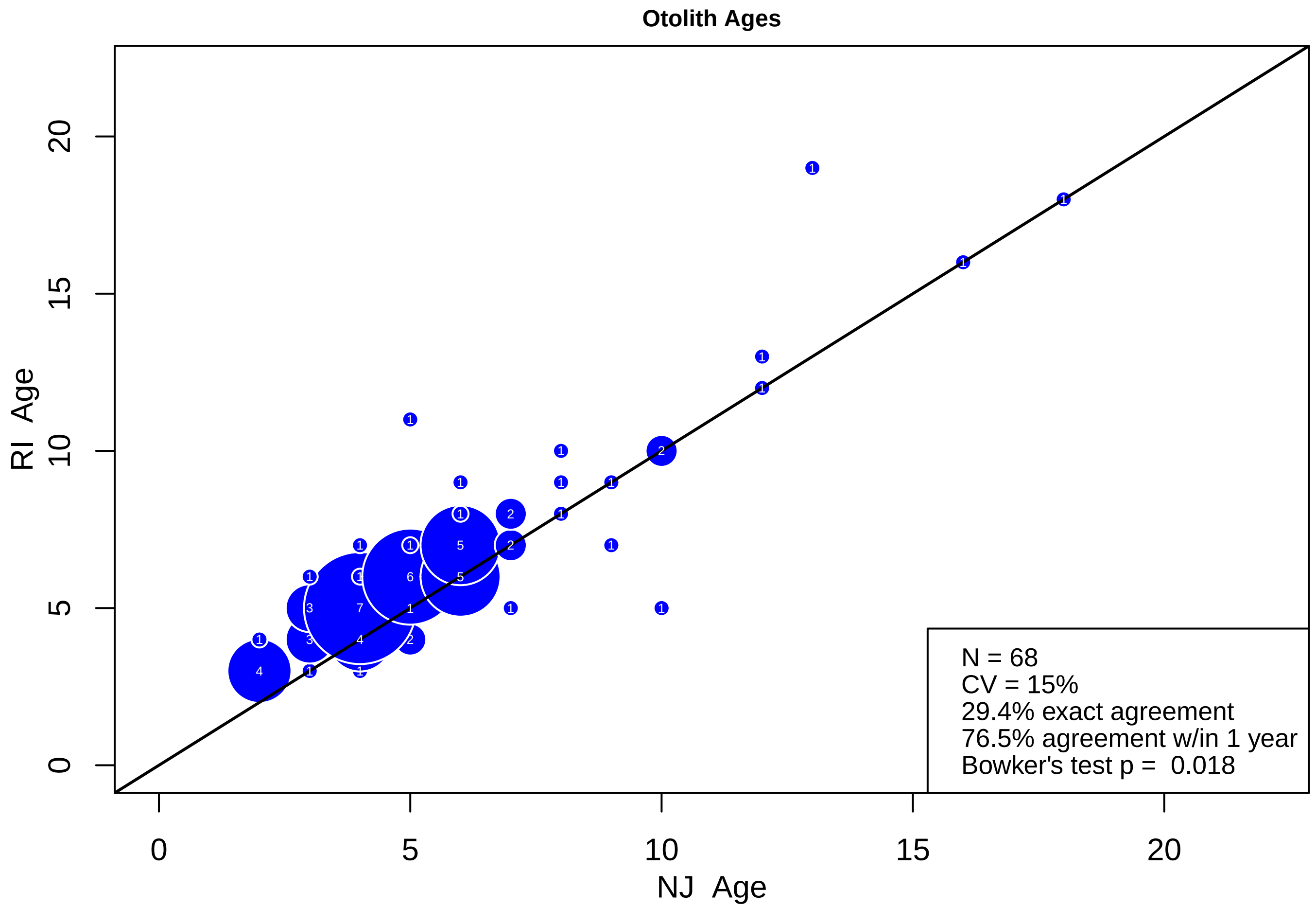
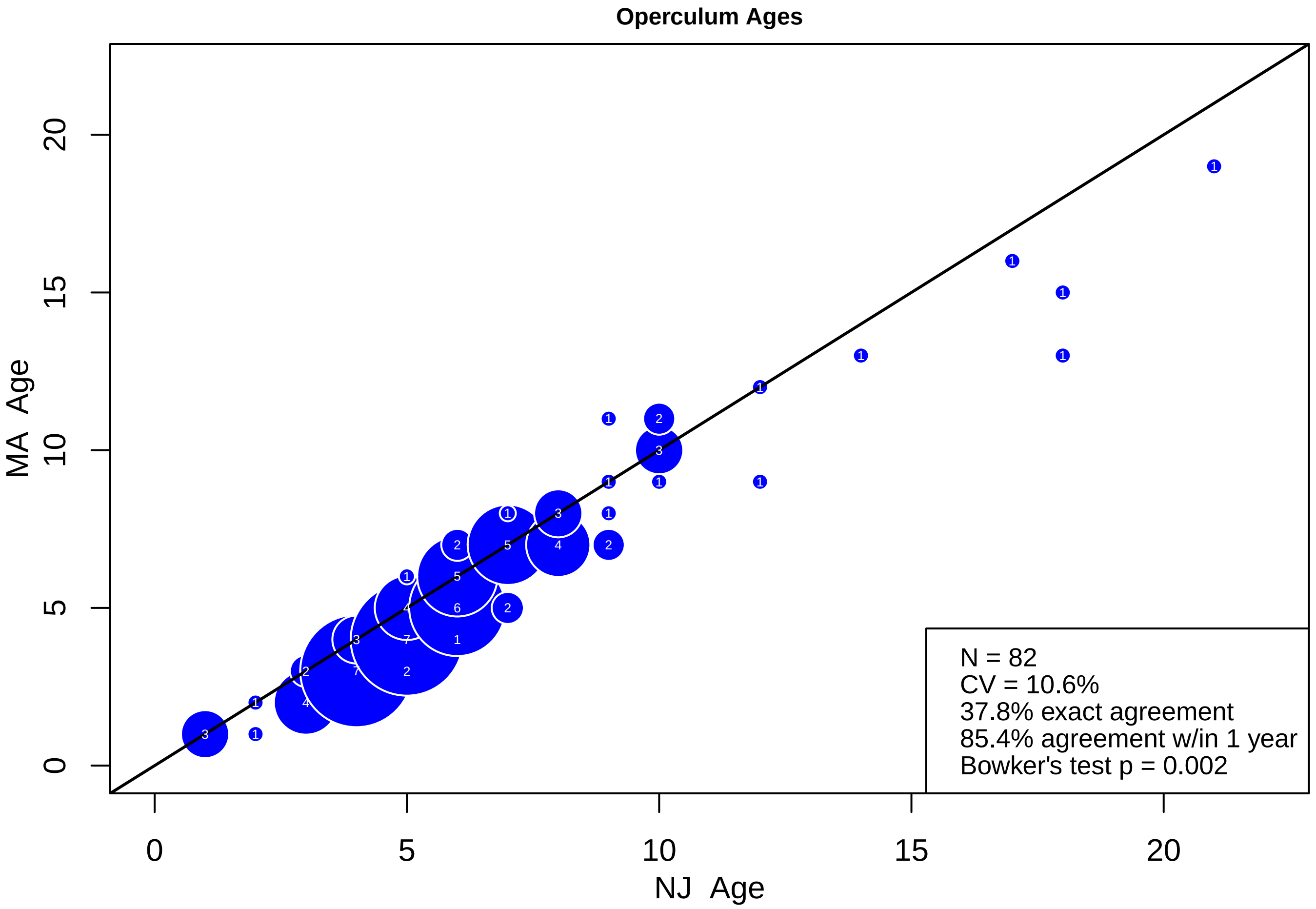


Figure 38: RI vs. NJ bias plots by hard part. Circles are proportional to number of observations.



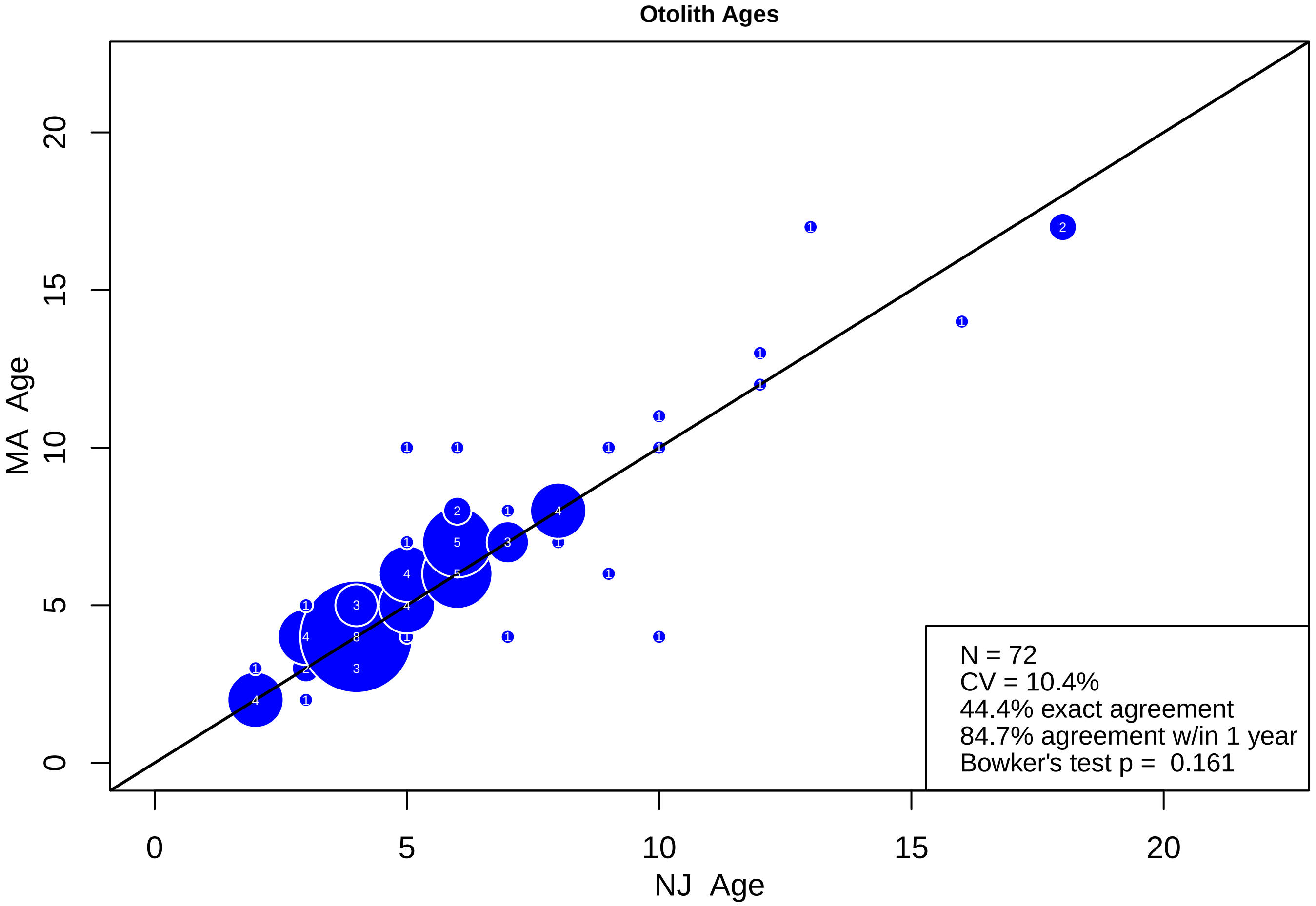


Figure 39: MA vs. NJ bias plots by hard part. Circles are proportional to number of observations.

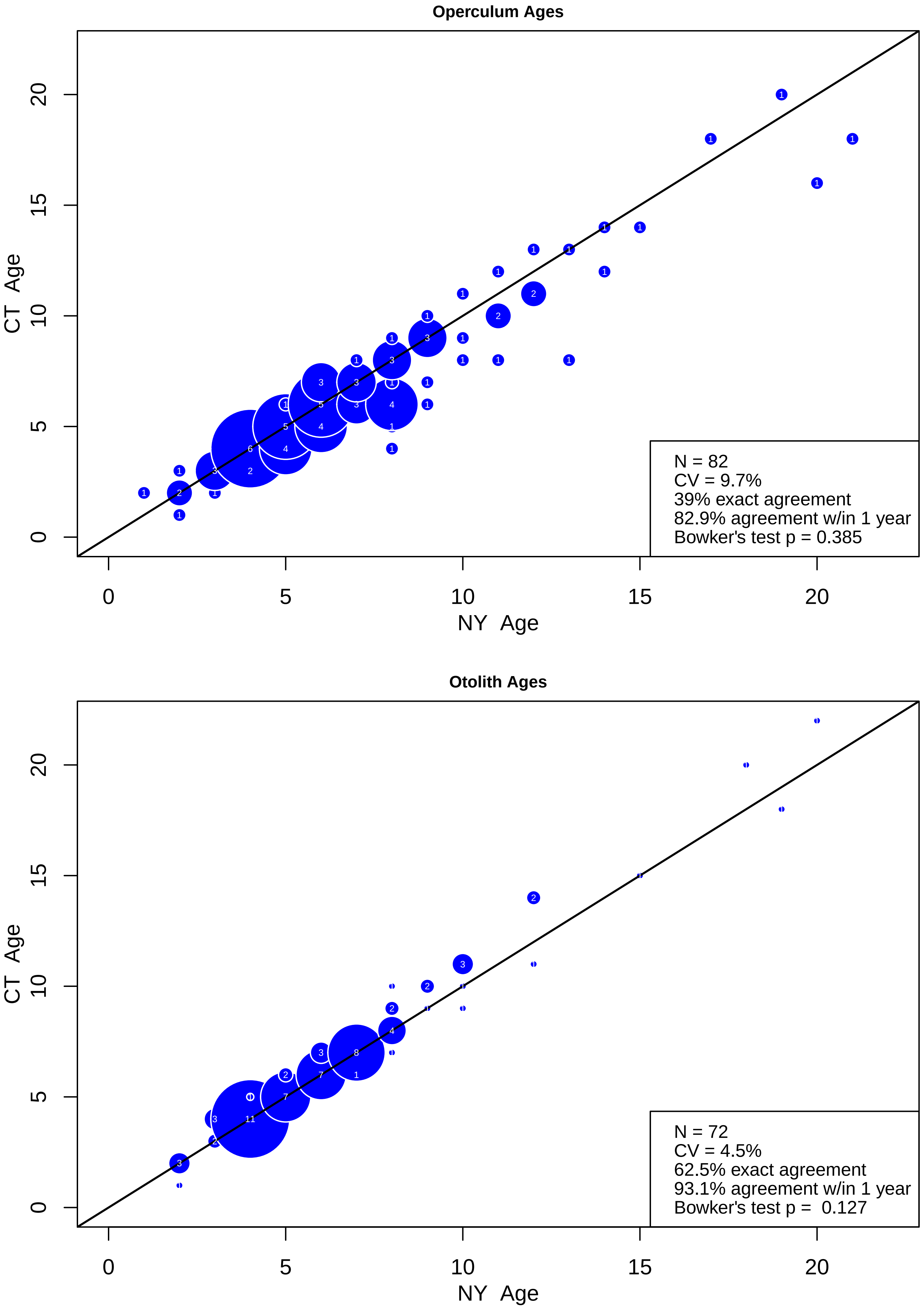
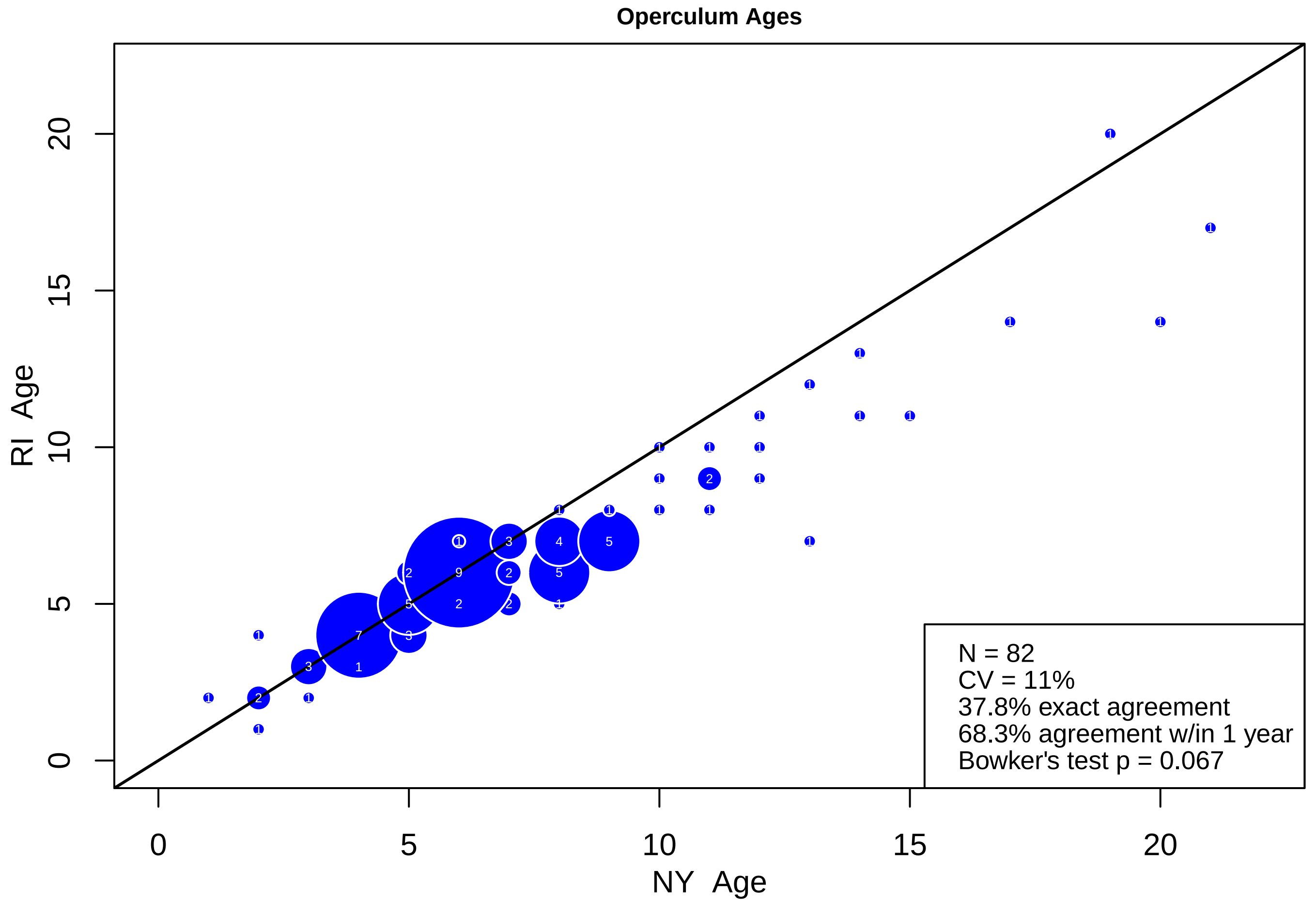


Figure 40: CT vs. NY bias plots by hard part. Circles are proportional to number of observations.



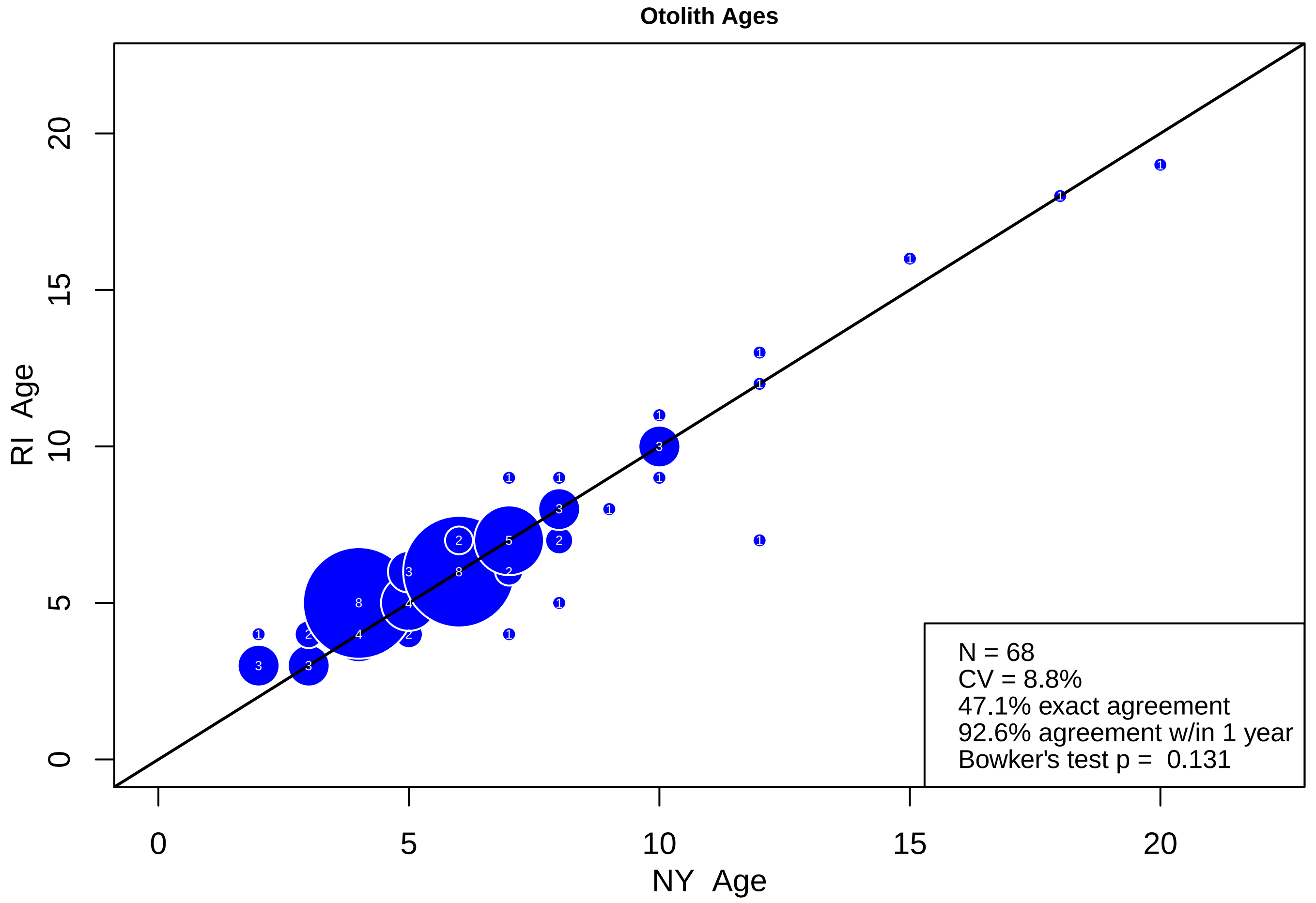


Figure 41: RI vs. NY bias plots by hard part. Circles are proportional to number of observations.

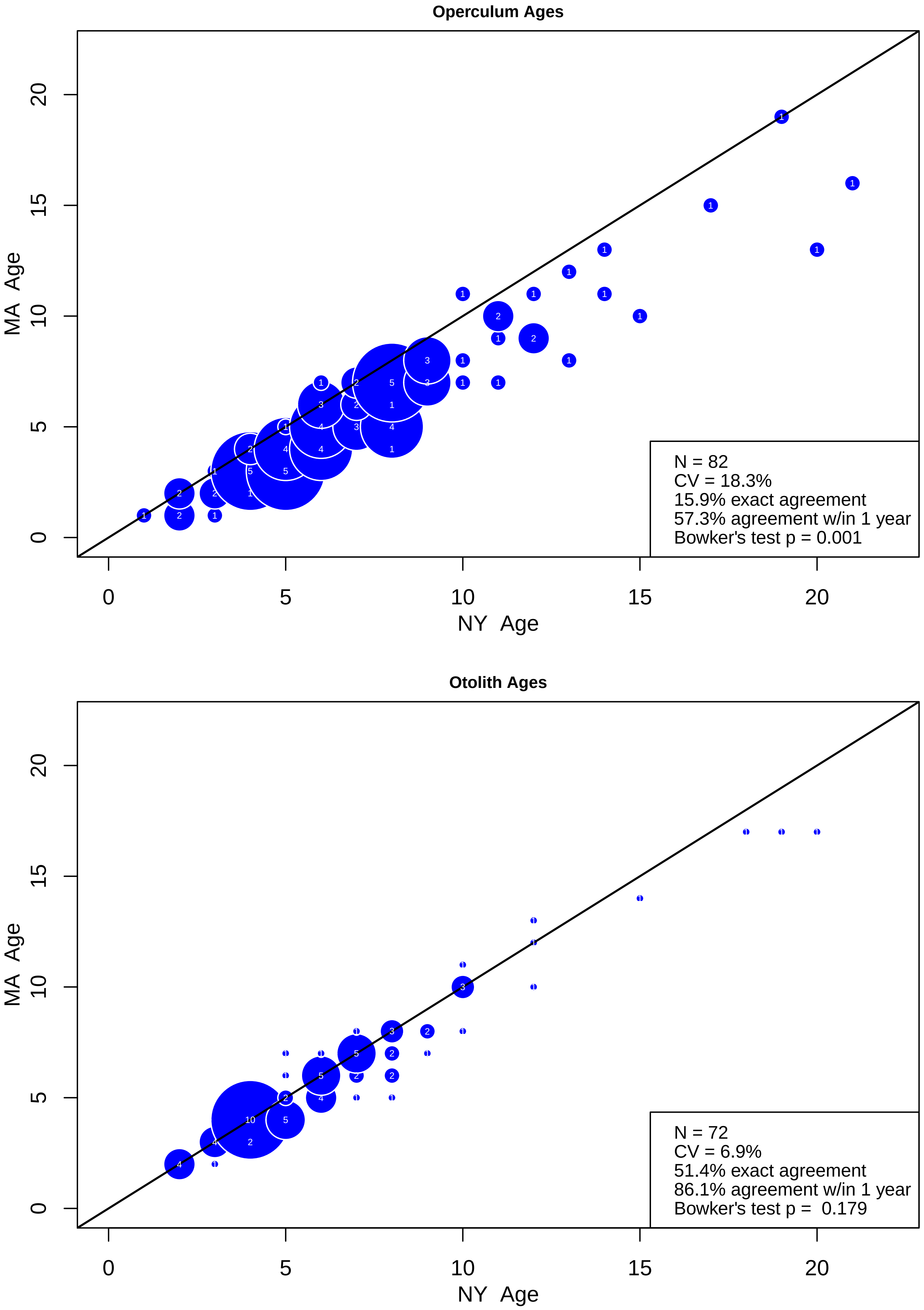
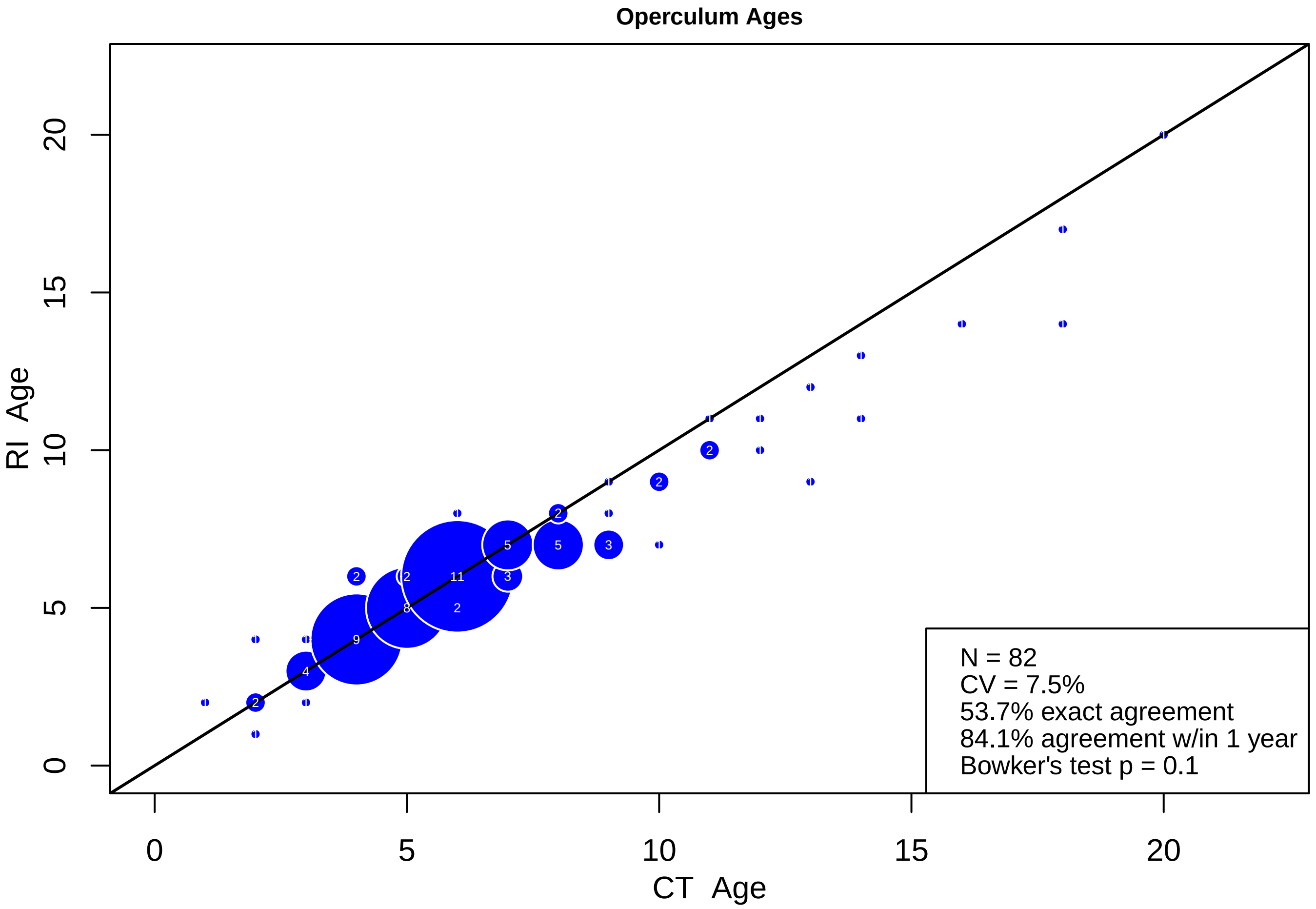


Figure 42: MA vs. NY bias plots by hard part. Circles are proportional to number of observations.



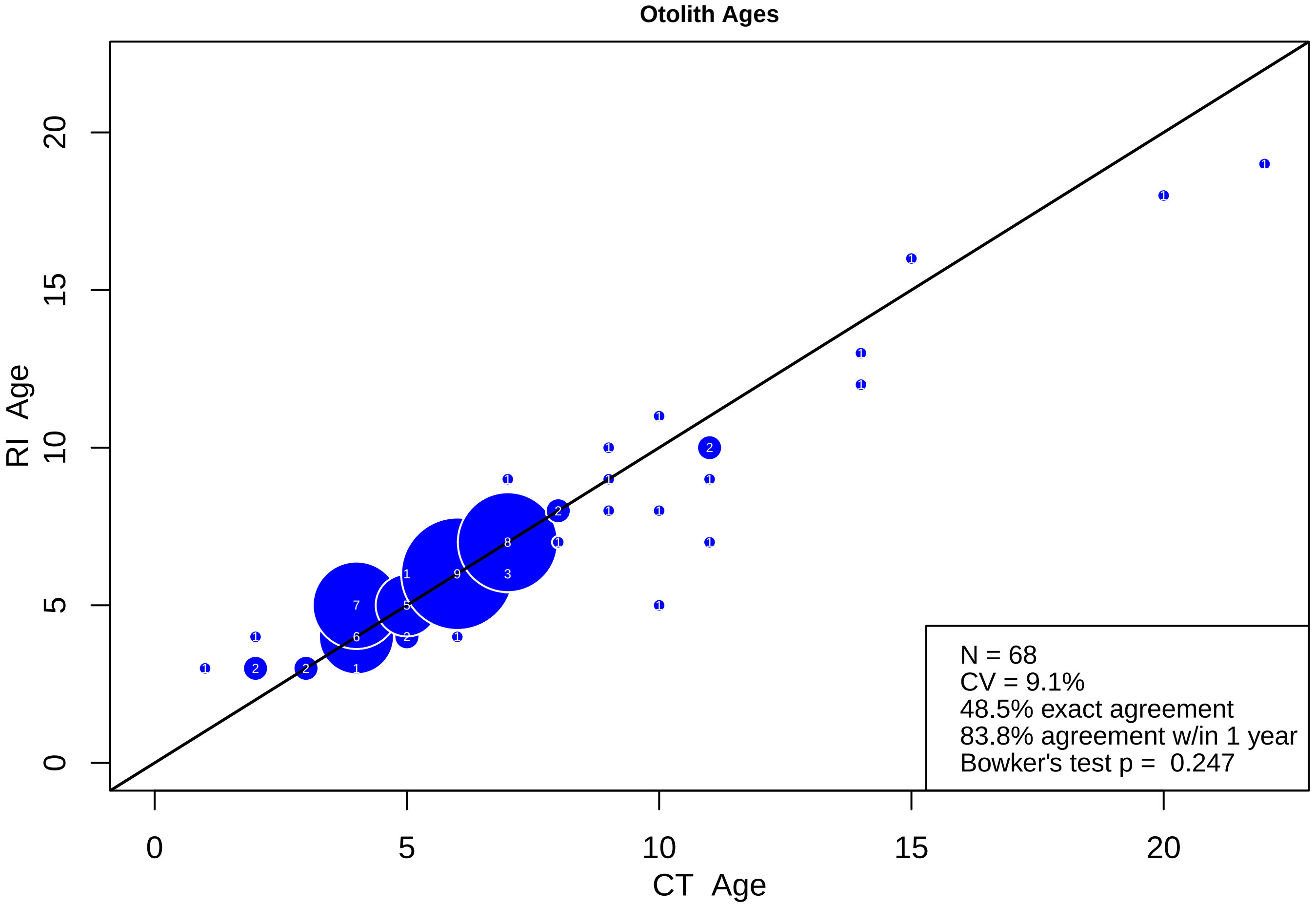
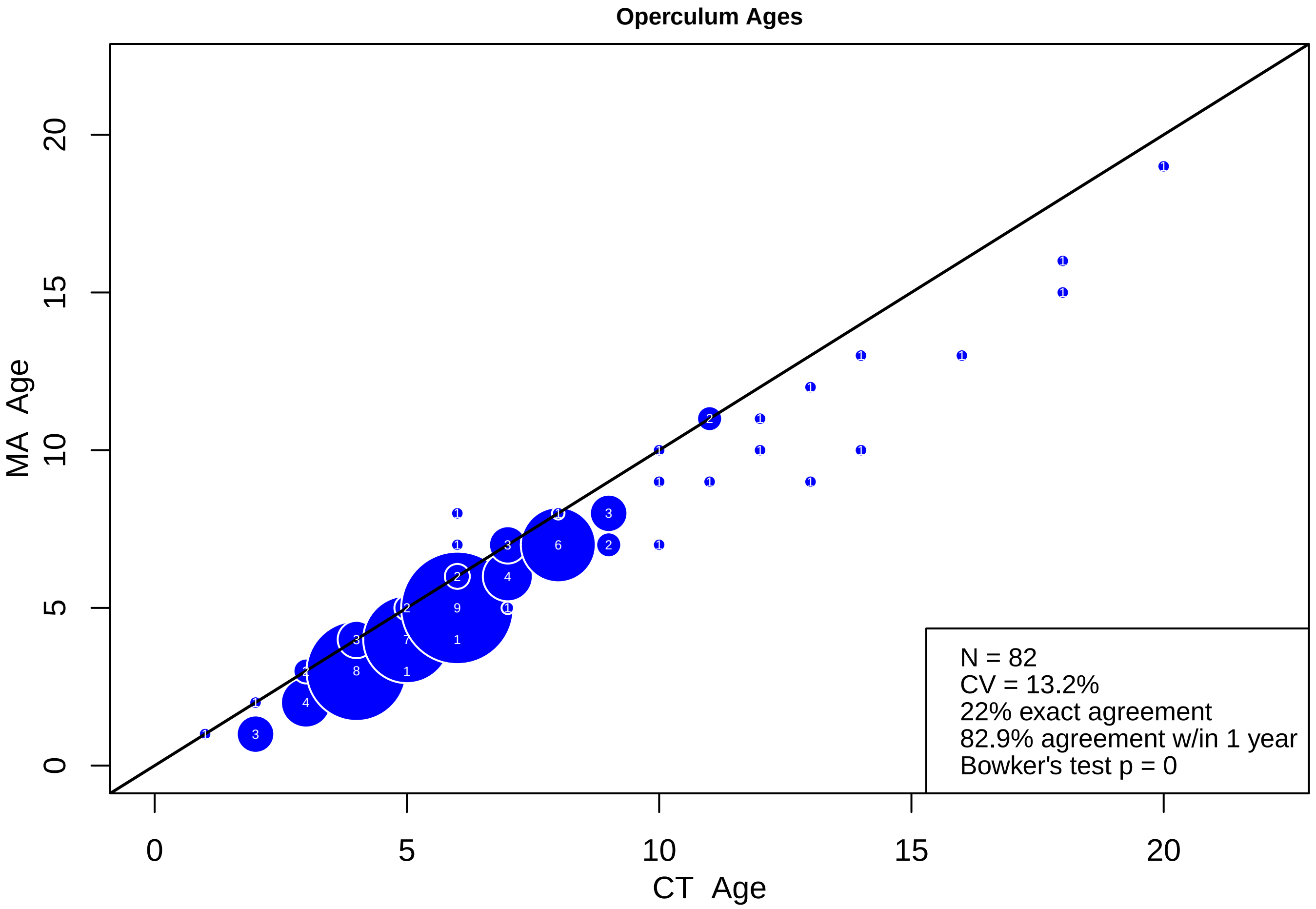


Figure 43: RI vs. CT bias plots by hard part. Circles are proportional to number of observations.



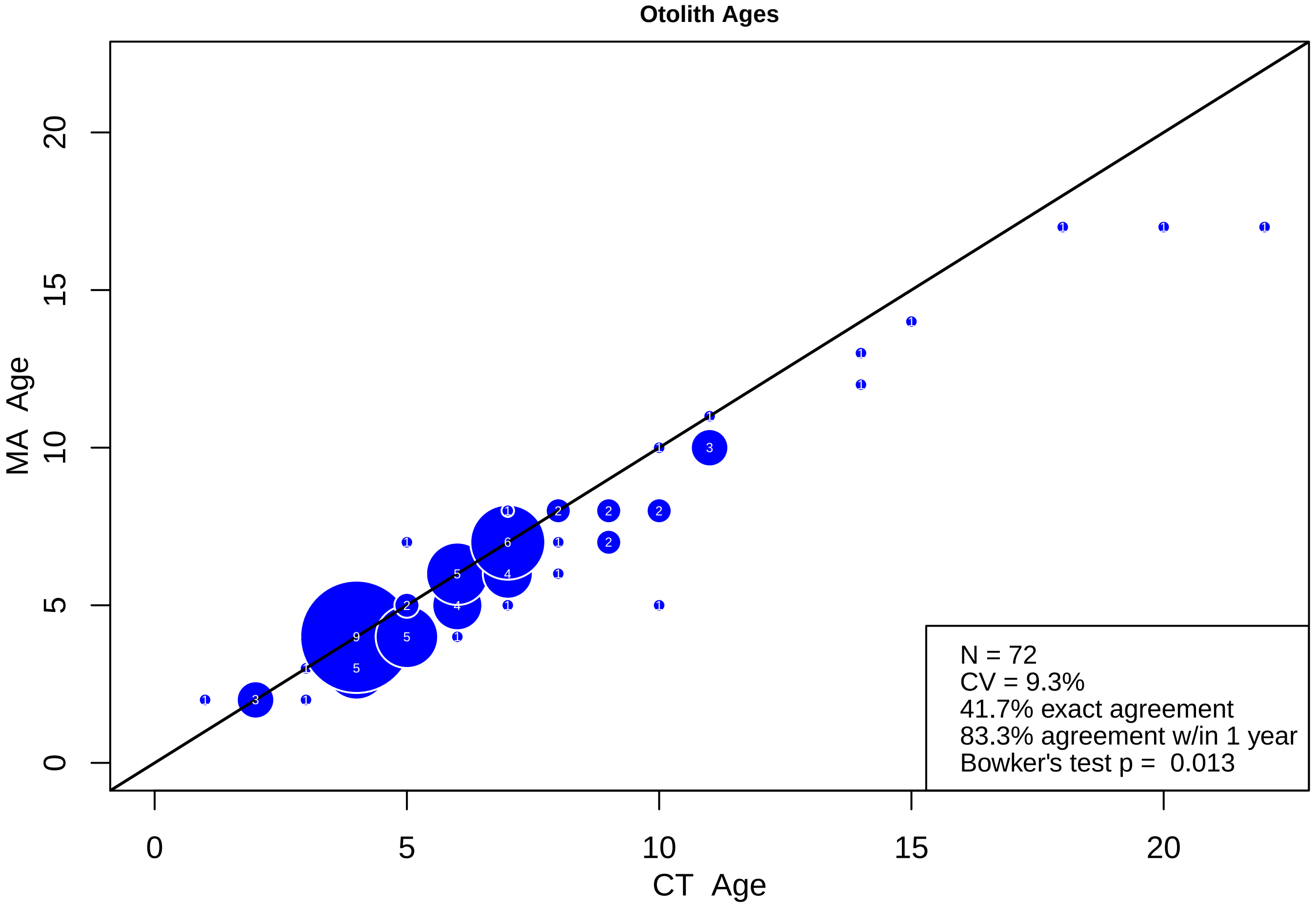


Figure 44: MA vs. CT bias plots by hard part. Circles are proportional to number of observations.

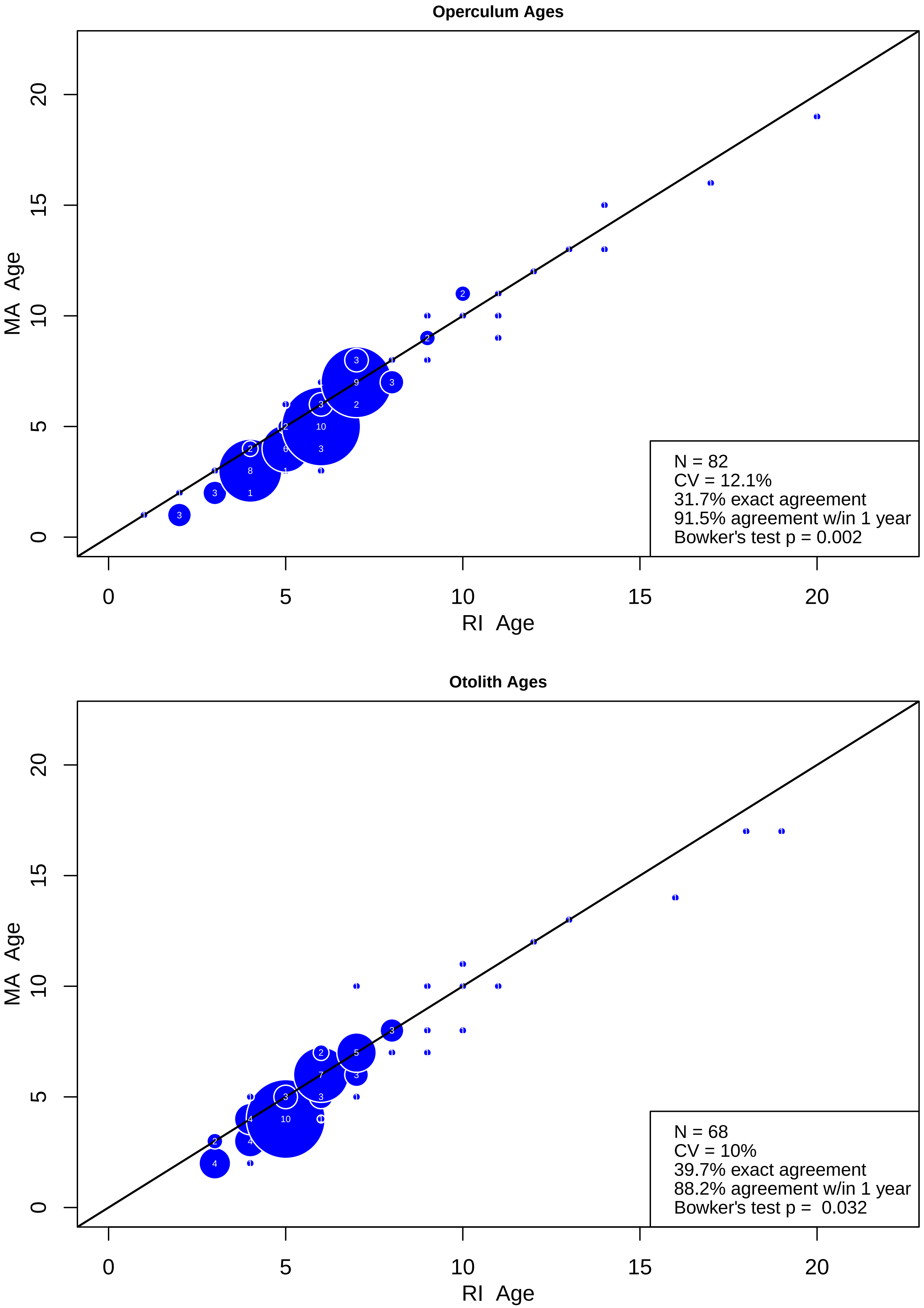


Figure 45: MA vs. RI bias plots by hard part. Circles are proportional to number of observations.

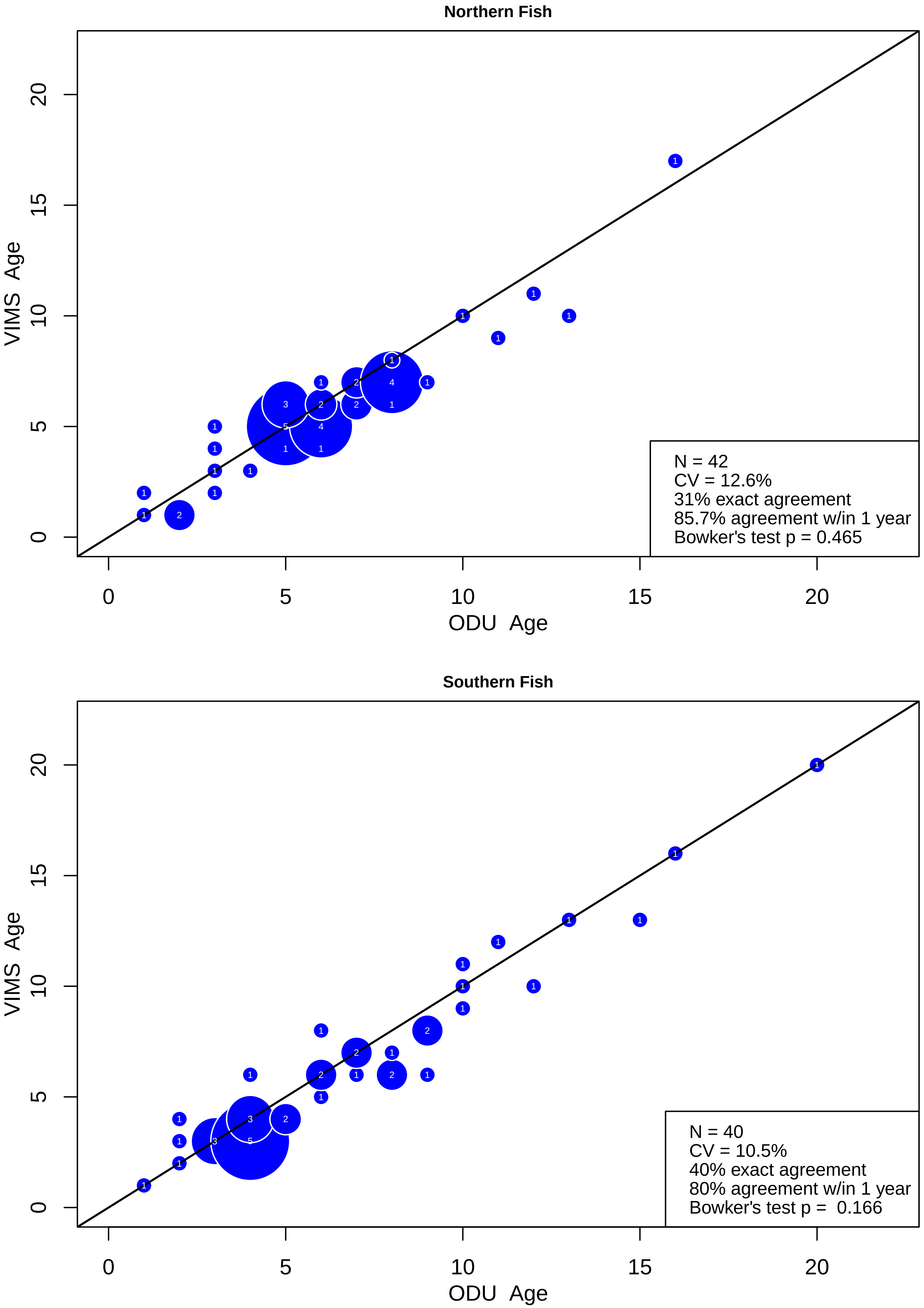


Figure 46: VIMS vs. ODU bias plots of operculum ages by region of sample origin.

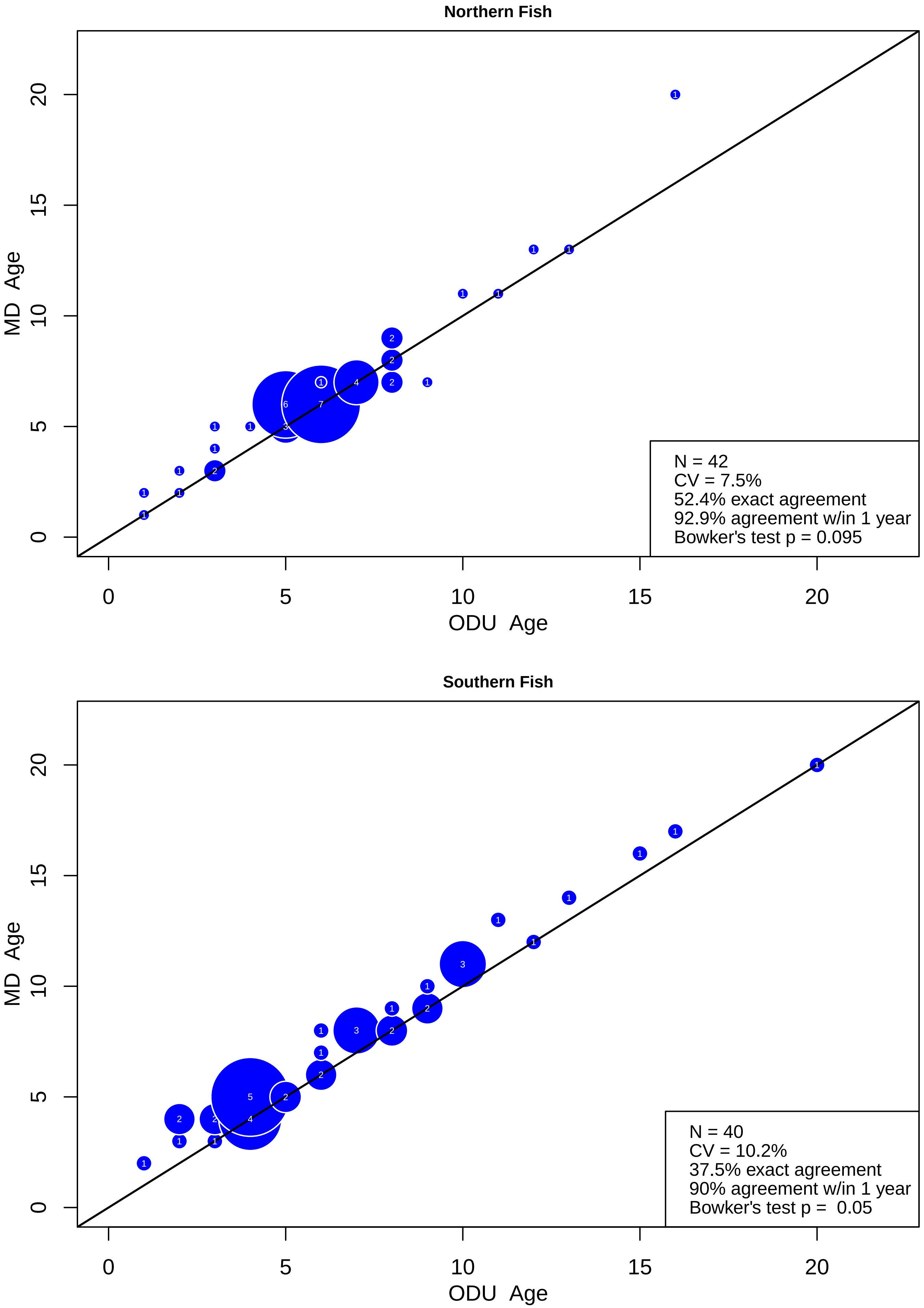


Figure 47: MD vs. ODU bias plots of operculum ages by region of sample origin.

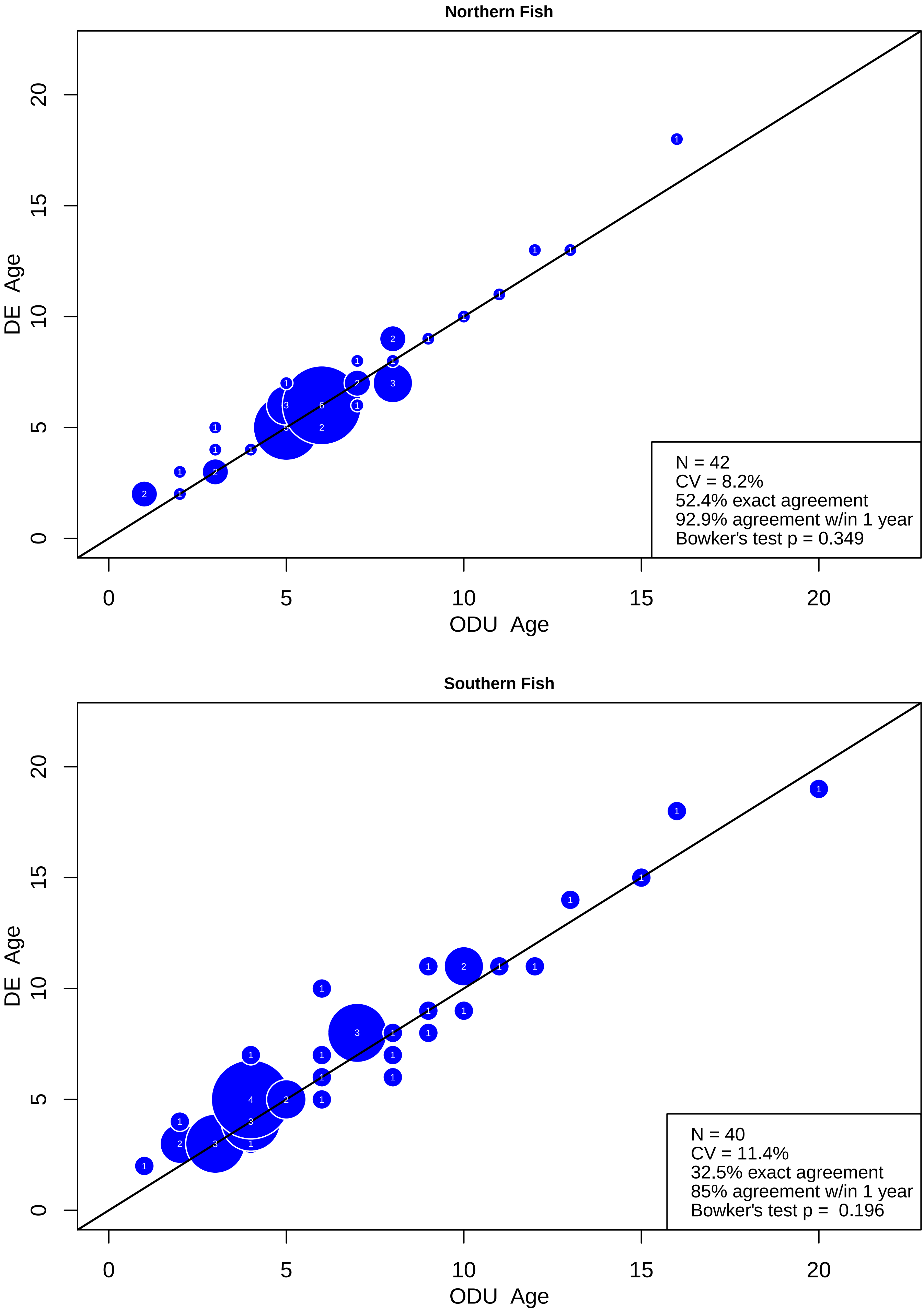
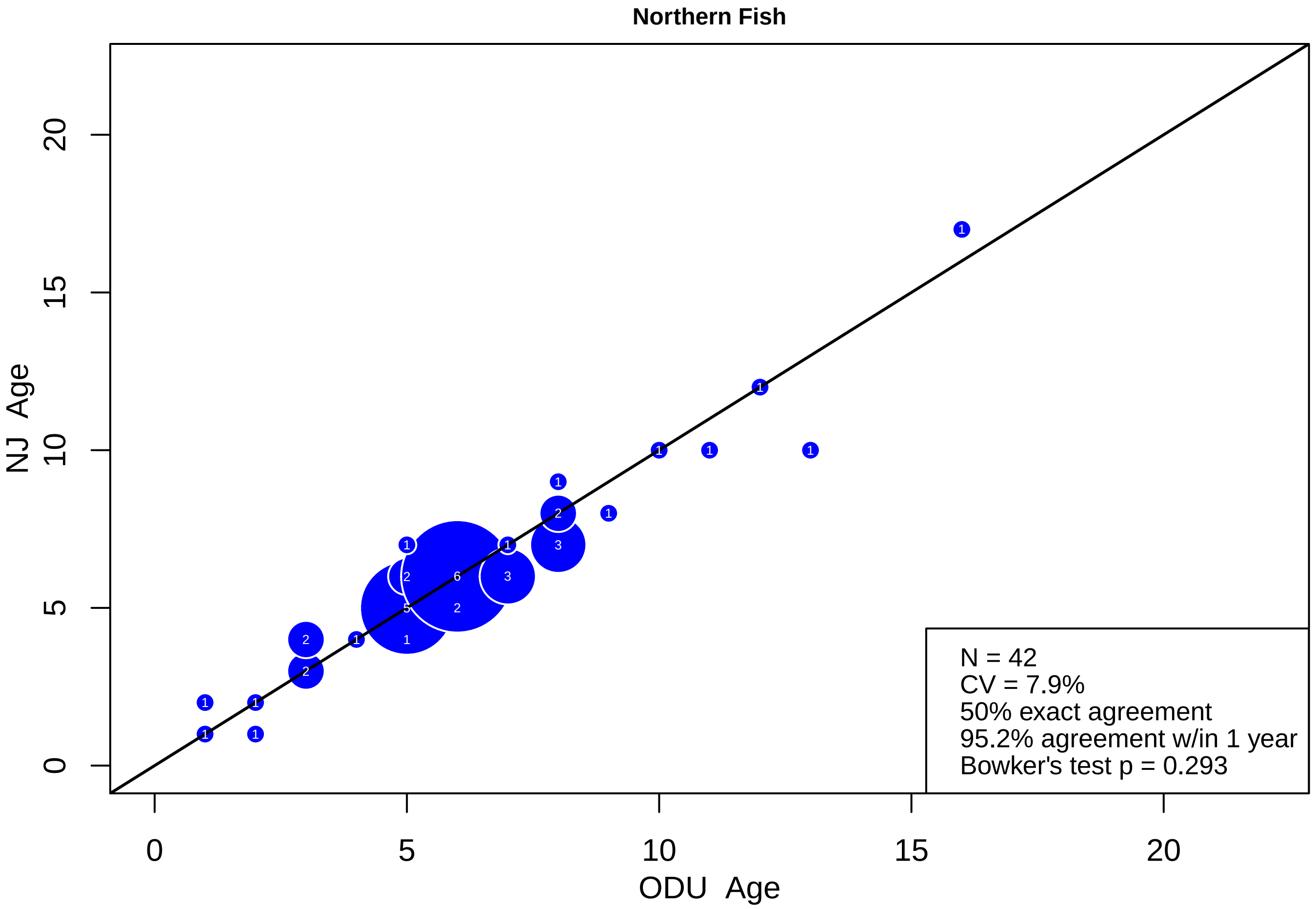


Figure 48: DE vs. ODU bias plots of operculum ages by region of sample origin.



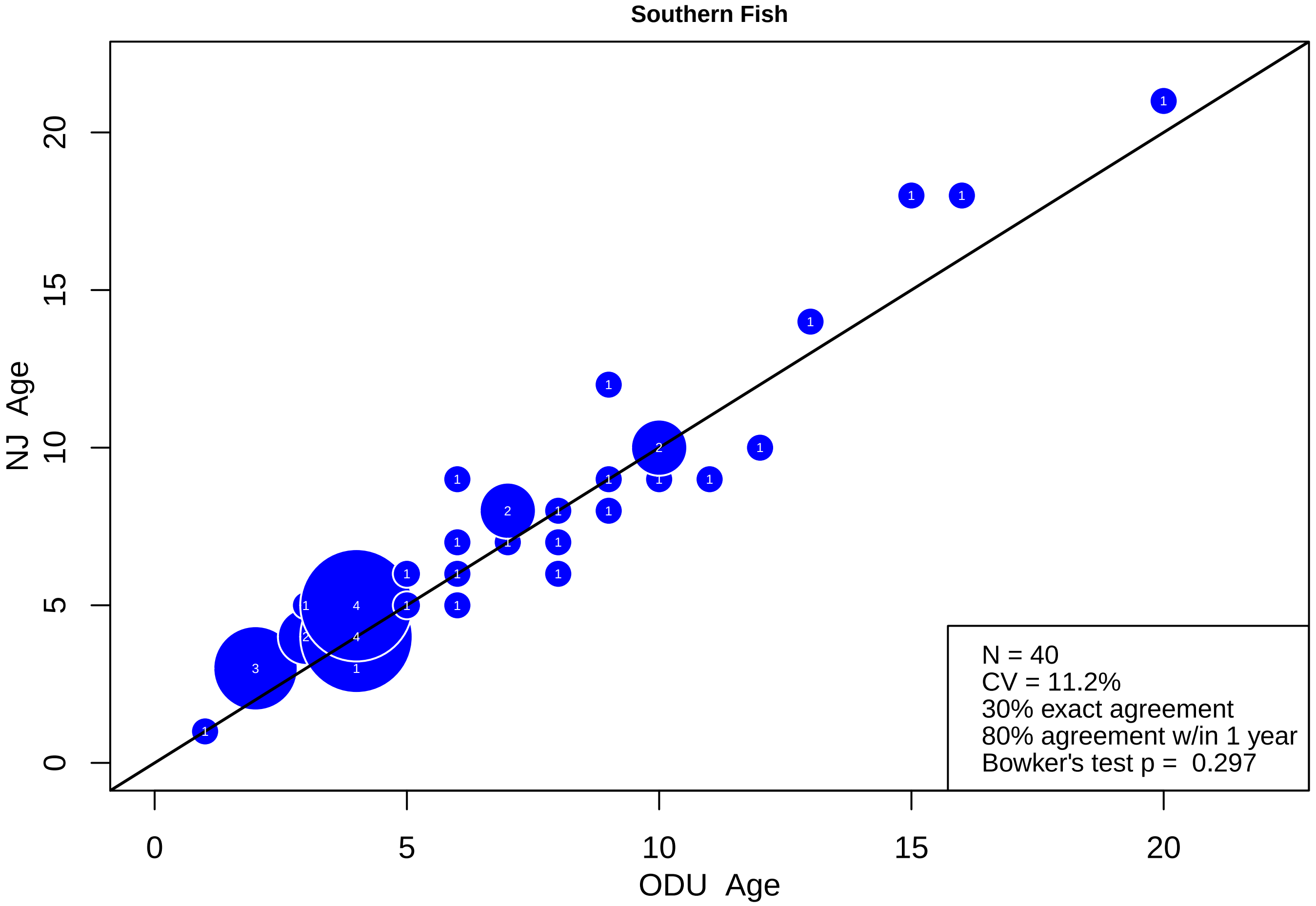


Figure 49: NJ vs. ODU bias plots of operculum ages by region of sample origin.

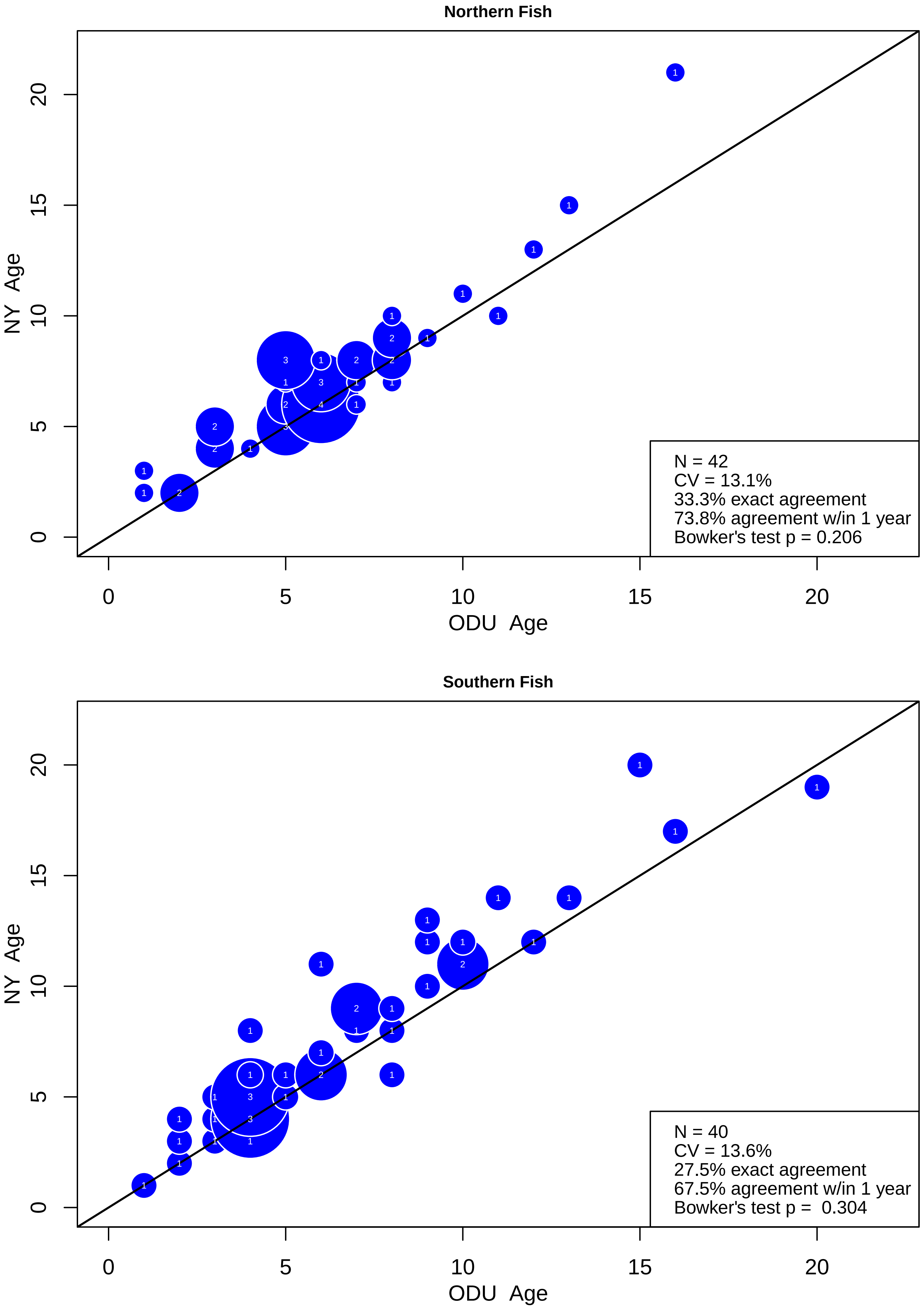
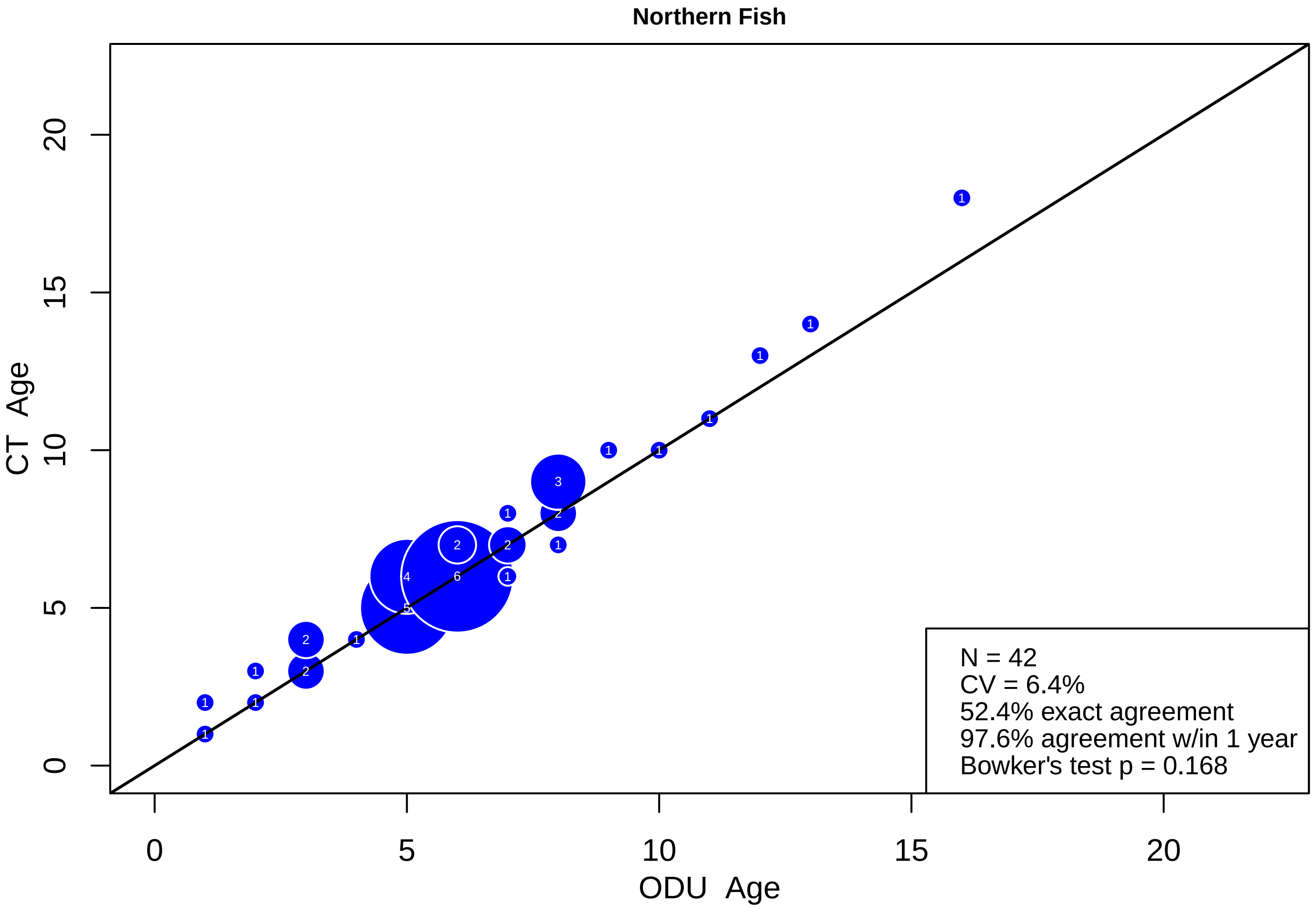


Figure 50: NY vs. ODU bias plots of operculum ages by region of sample origin.



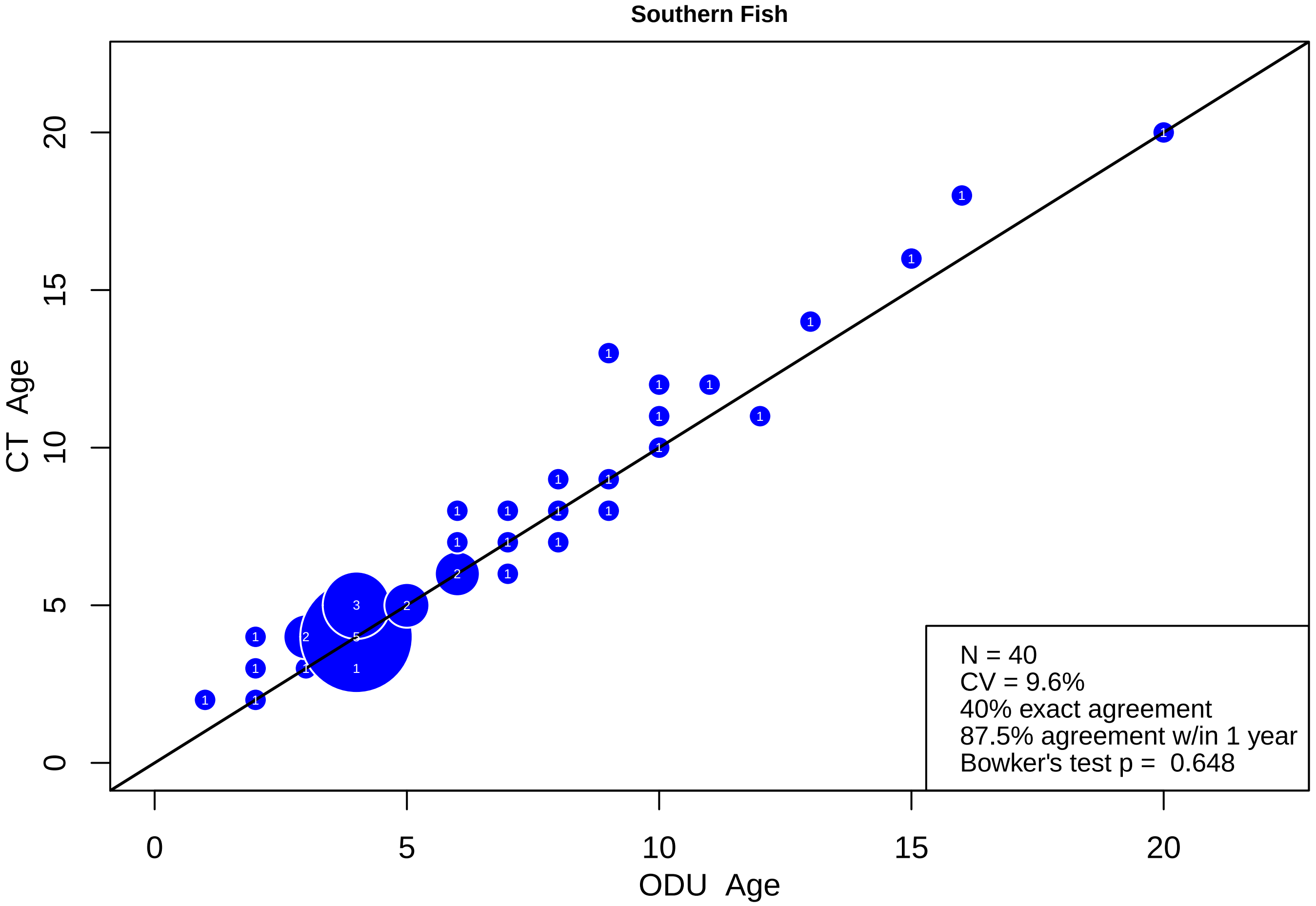


Figure 51: CT vs. ODU bias plots of operculum ages by region of sample origin.

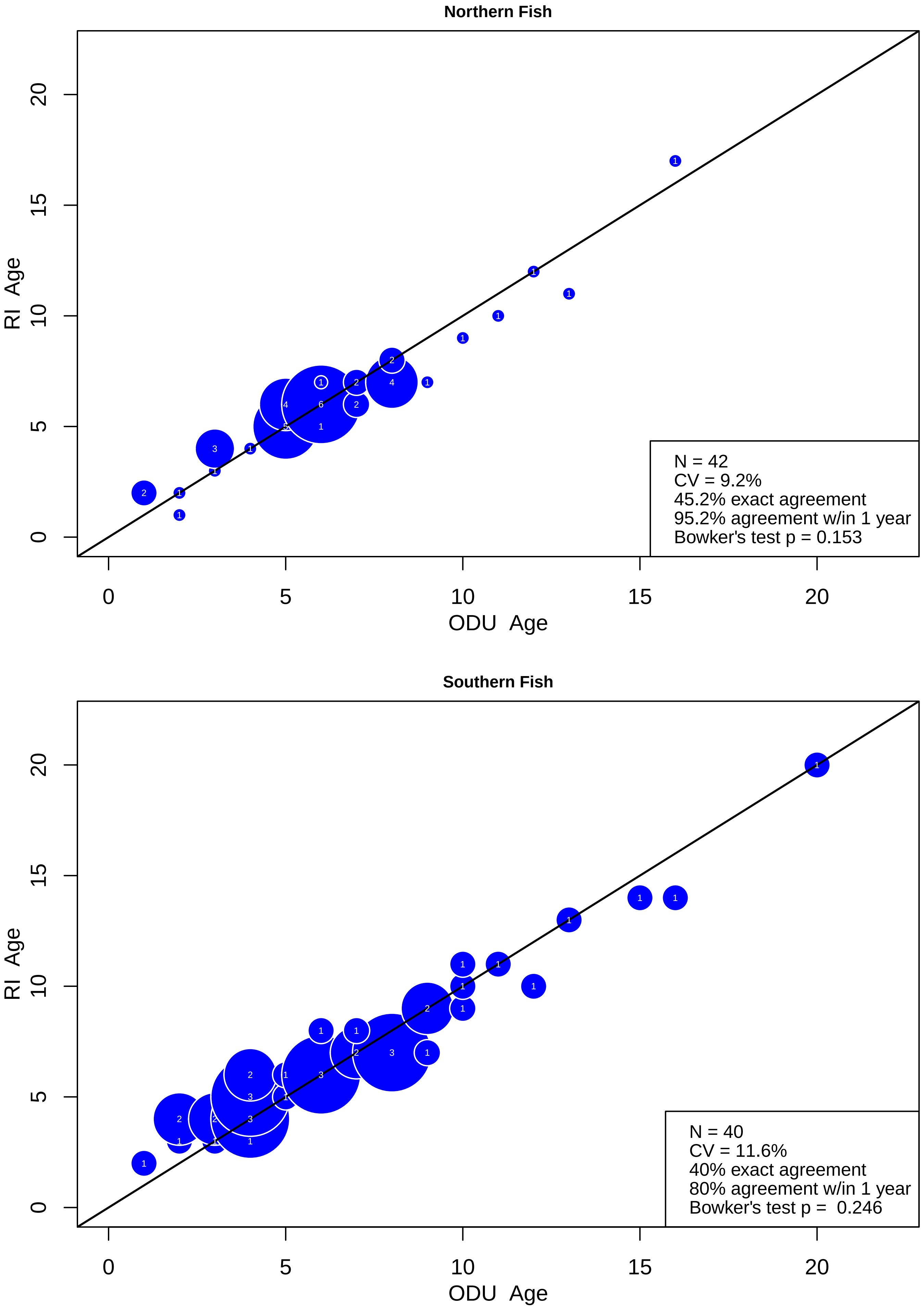
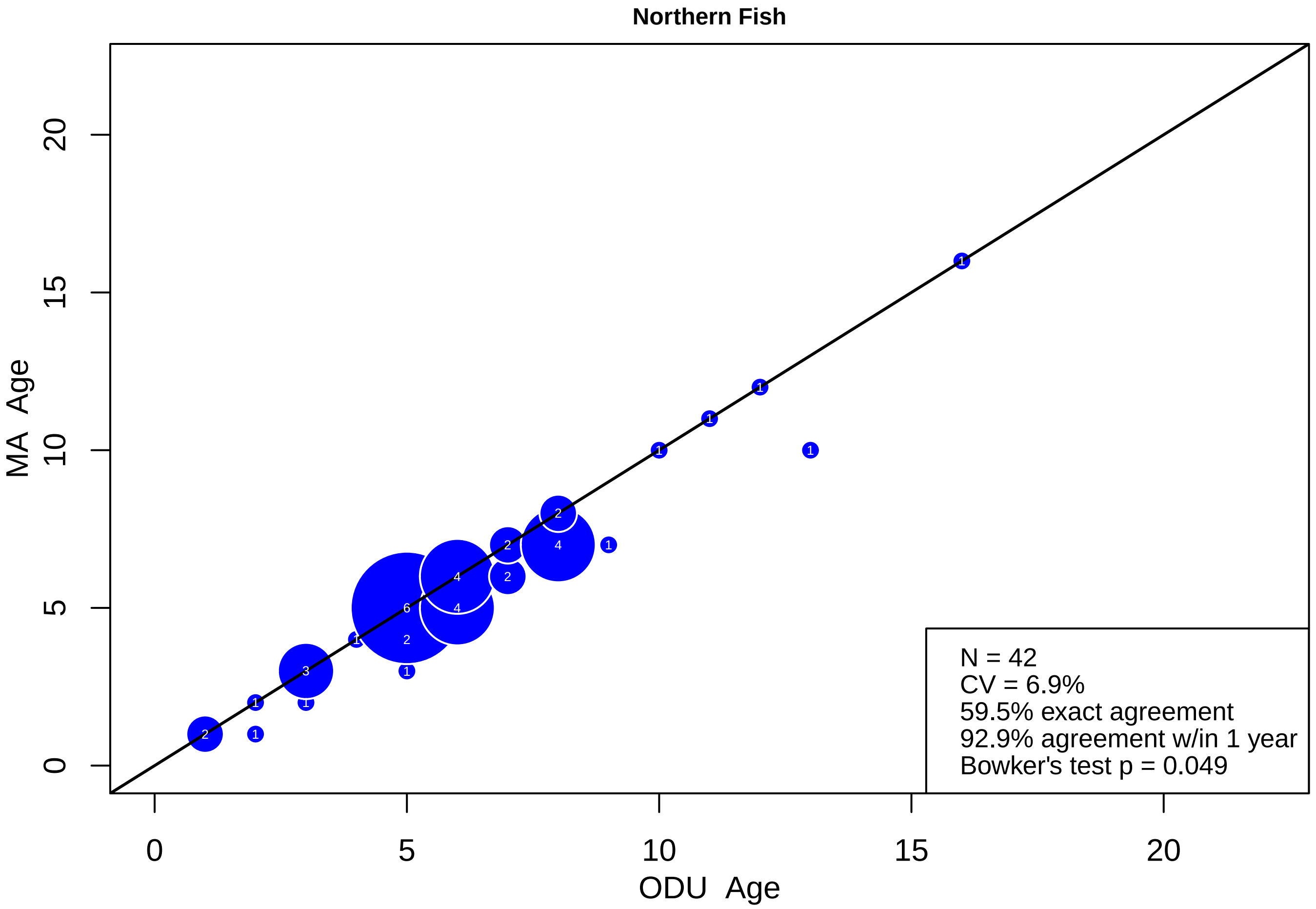


Figure 52: RI vs. ODU bias plots of operculum ages by region of sample origin.



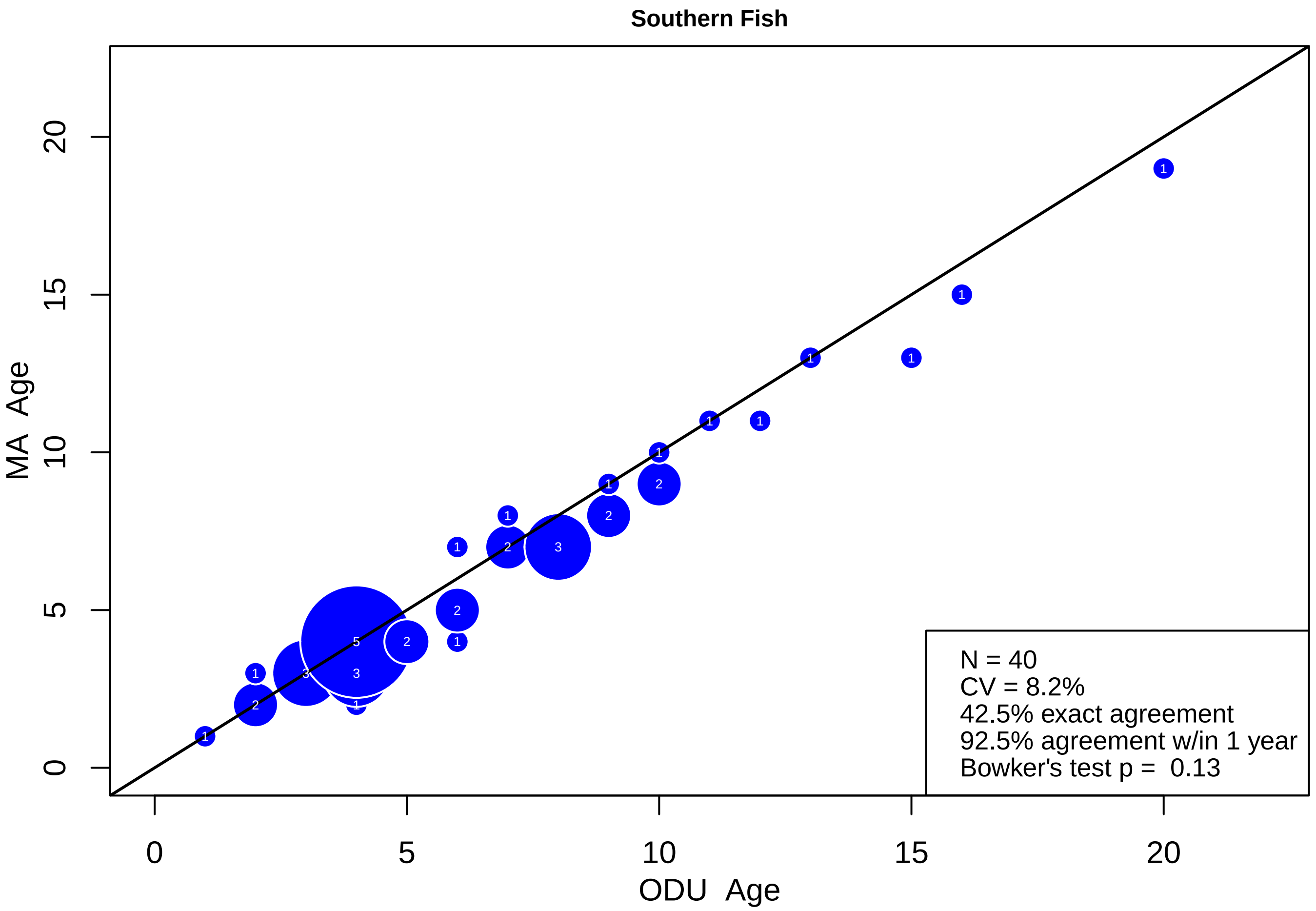
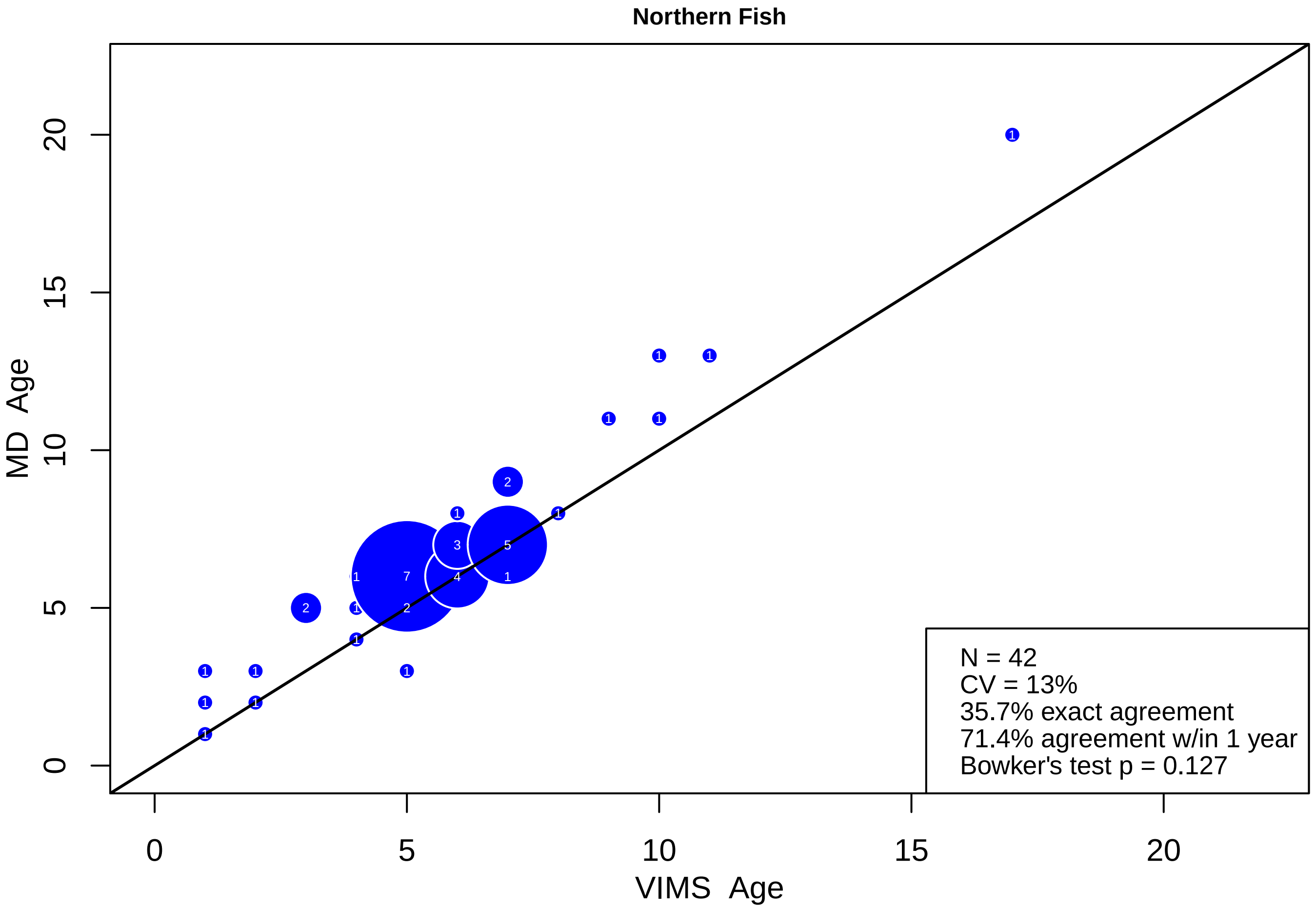


Figure 53: MA vs. ODU bias plots of operculum ages by region of sample origin.



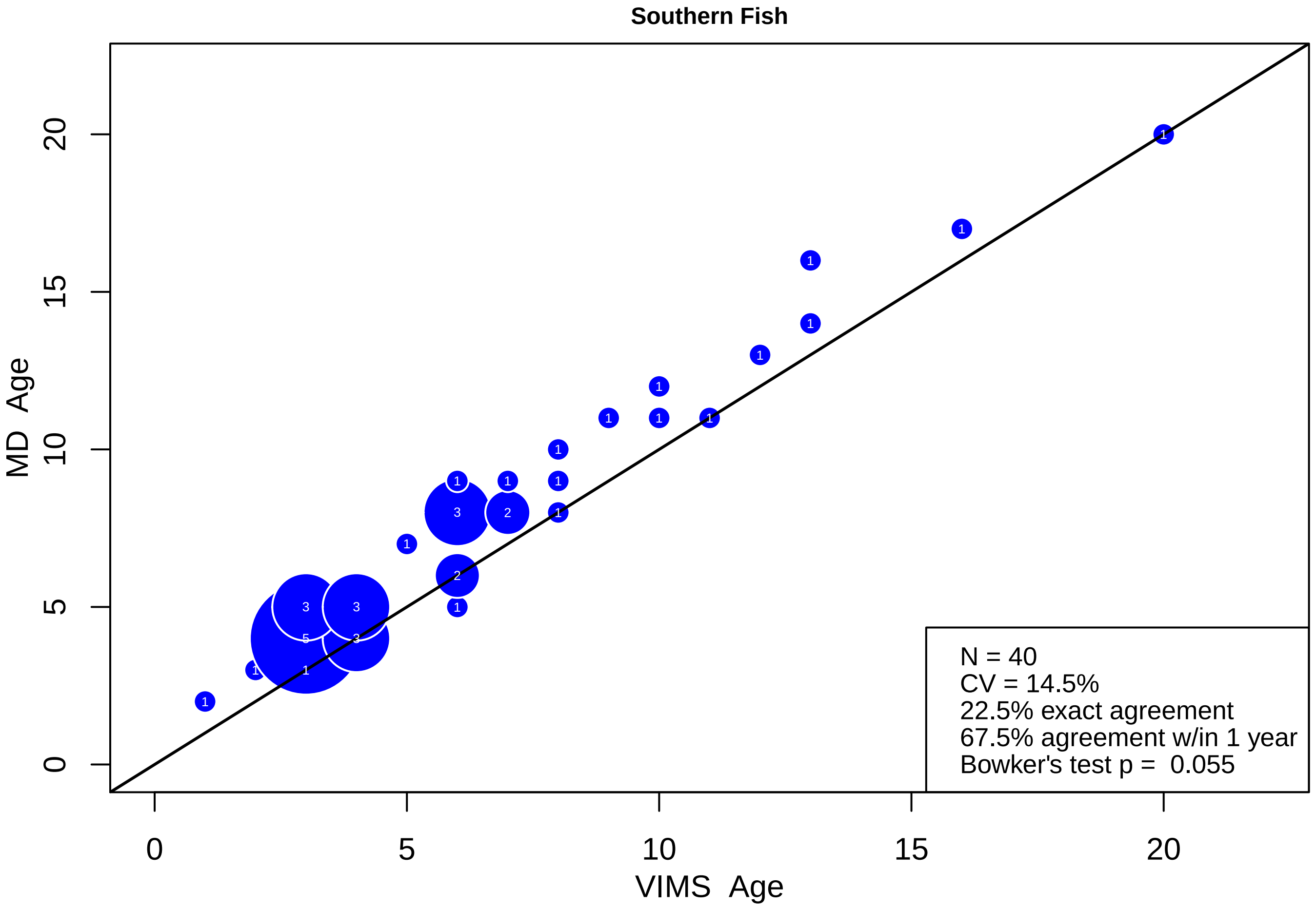
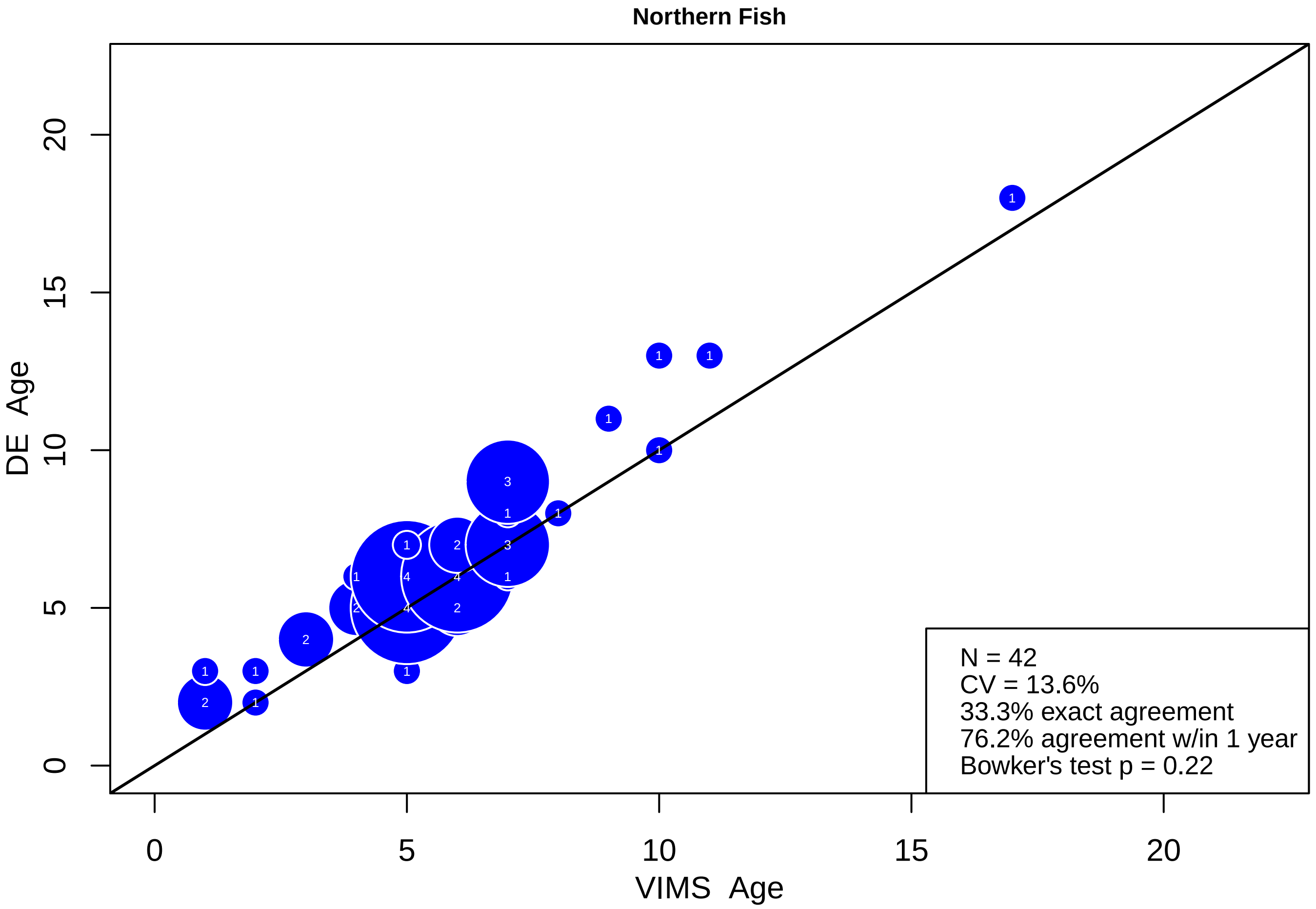


Figure 54: MD vs. VIMS bias plots of operculum ages by region of sample origin.



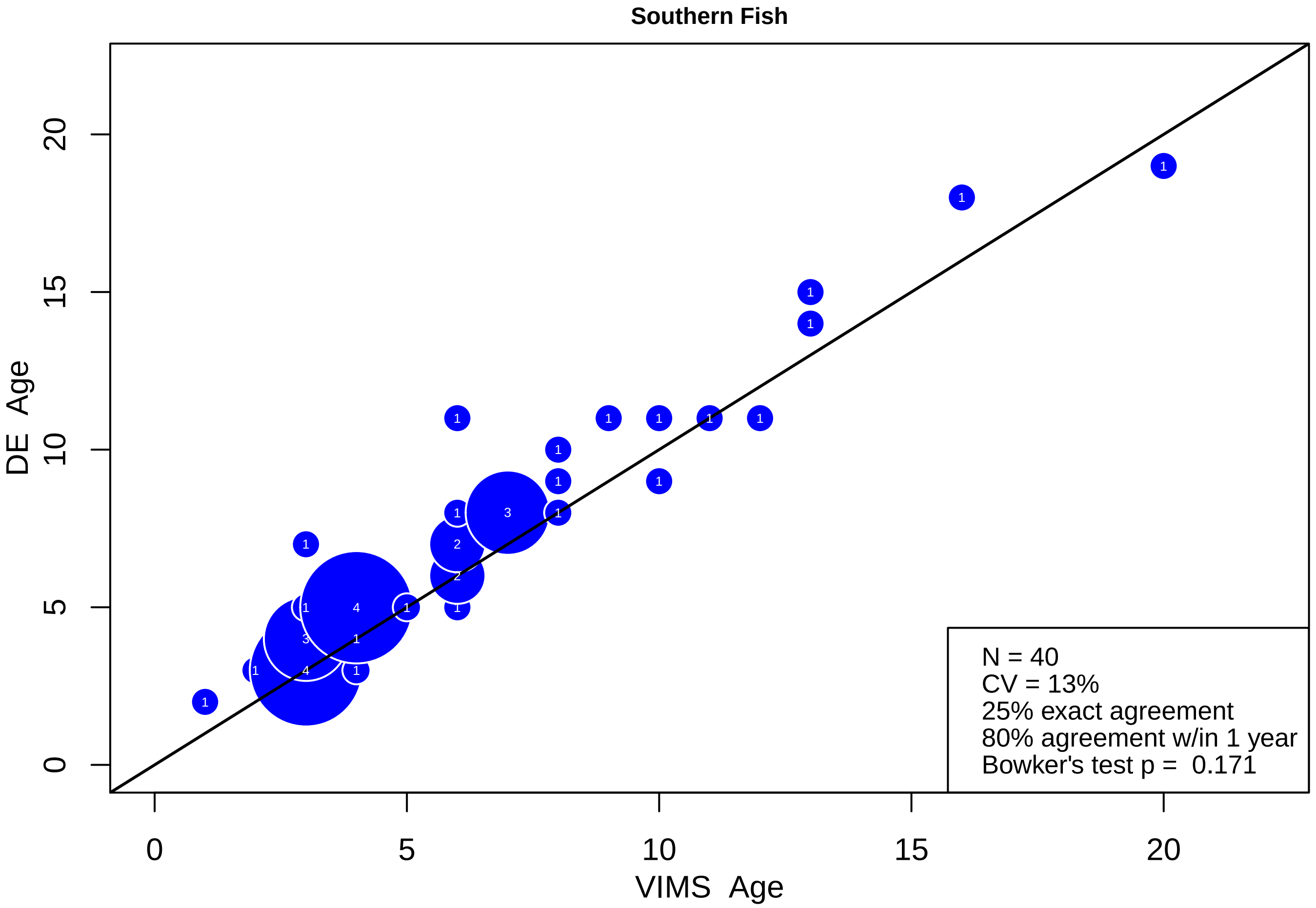
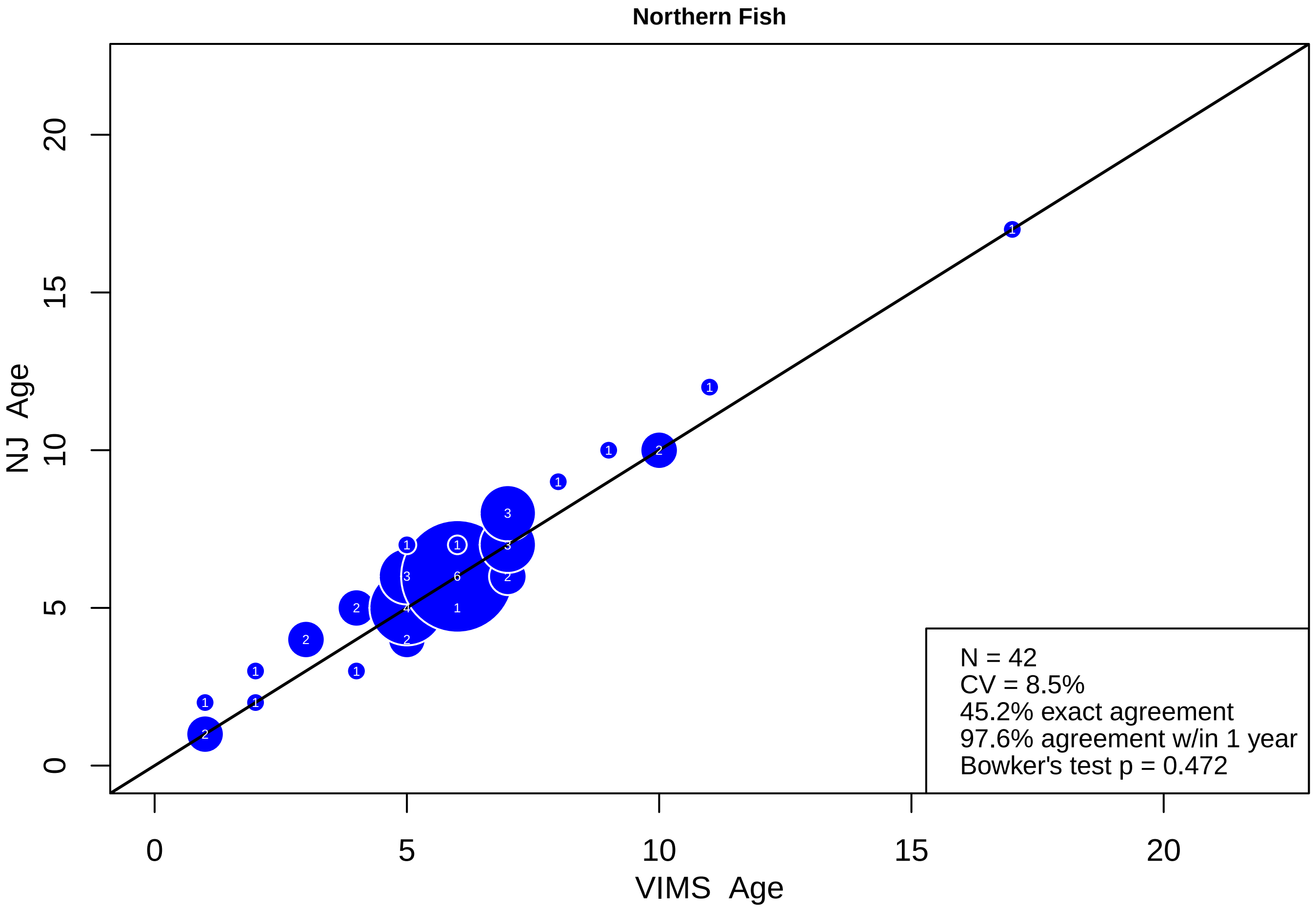


Figure 55: DE vs. VIMS bias plots of operculum ages by region of sample origin.



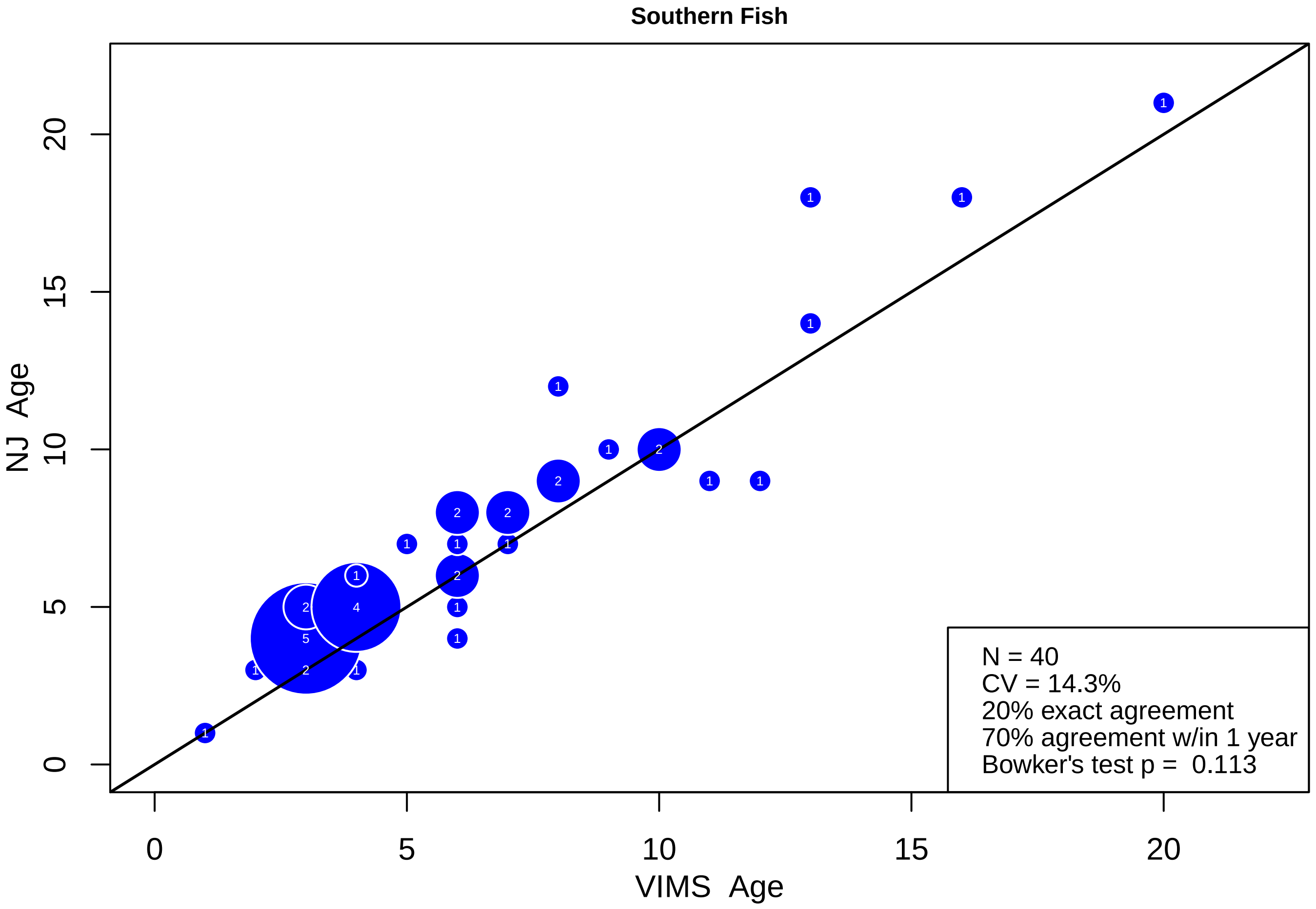
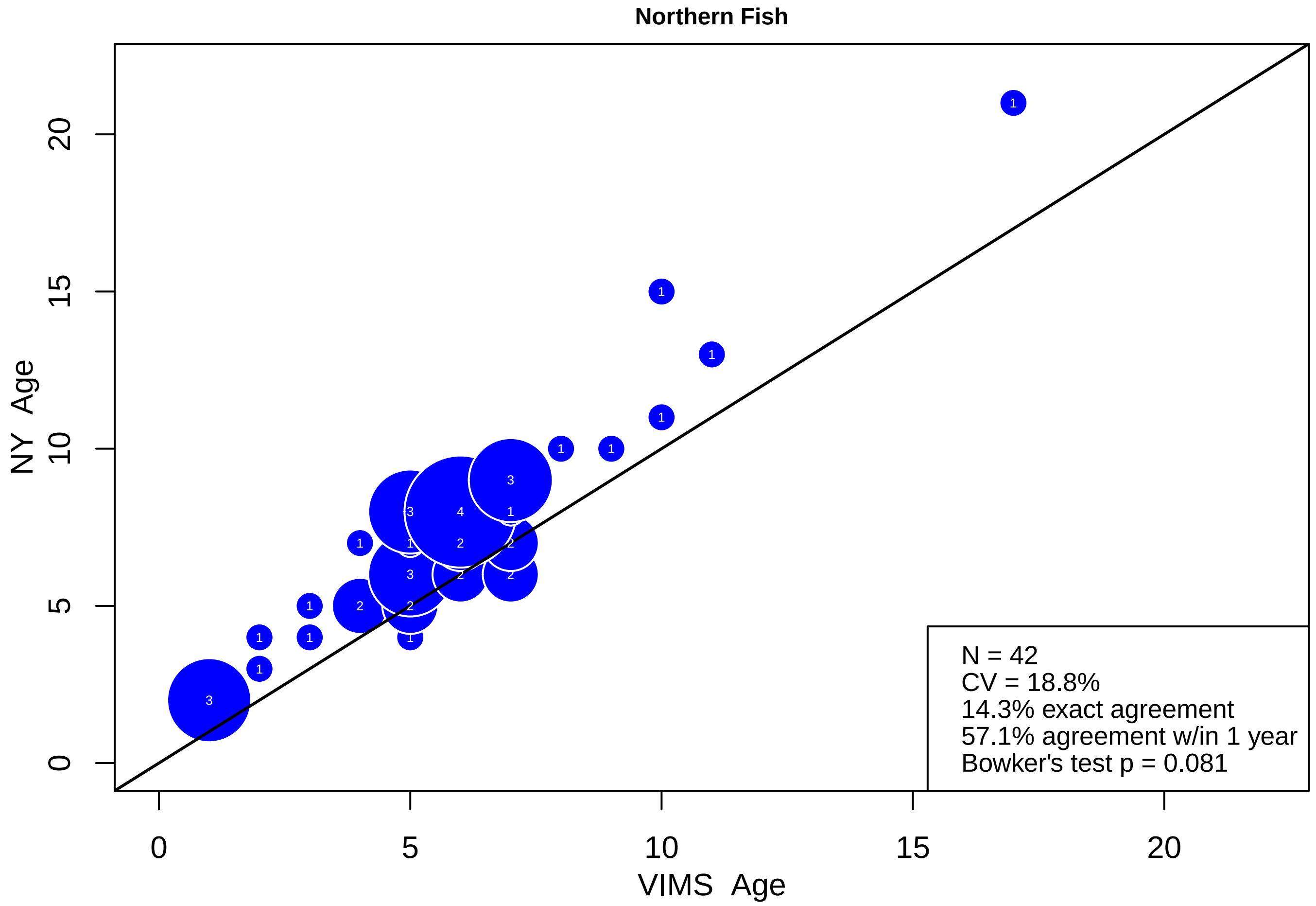


Figure 56: NJ vs. VIMS bias plots of operculum ages by region of sample origin.



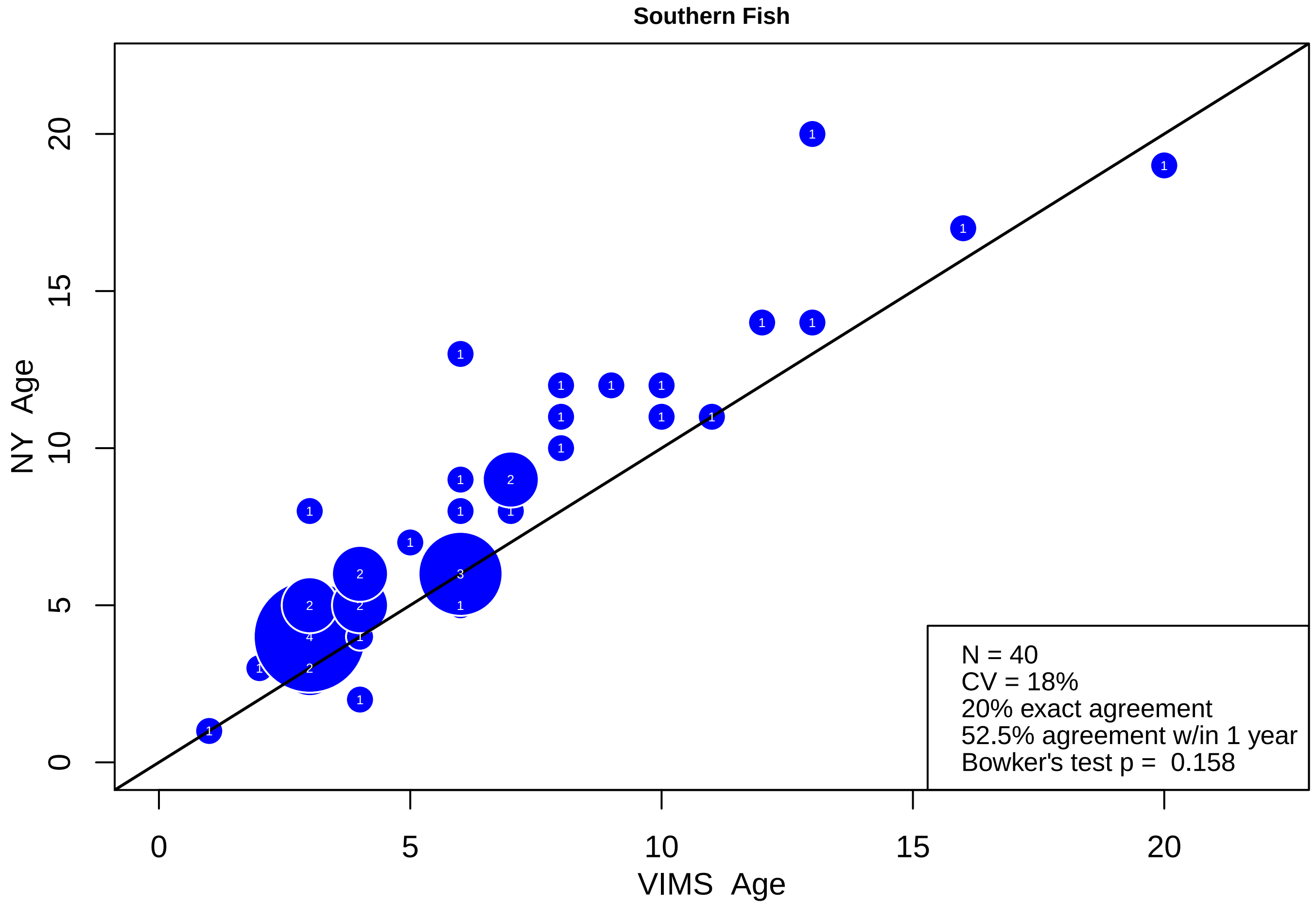
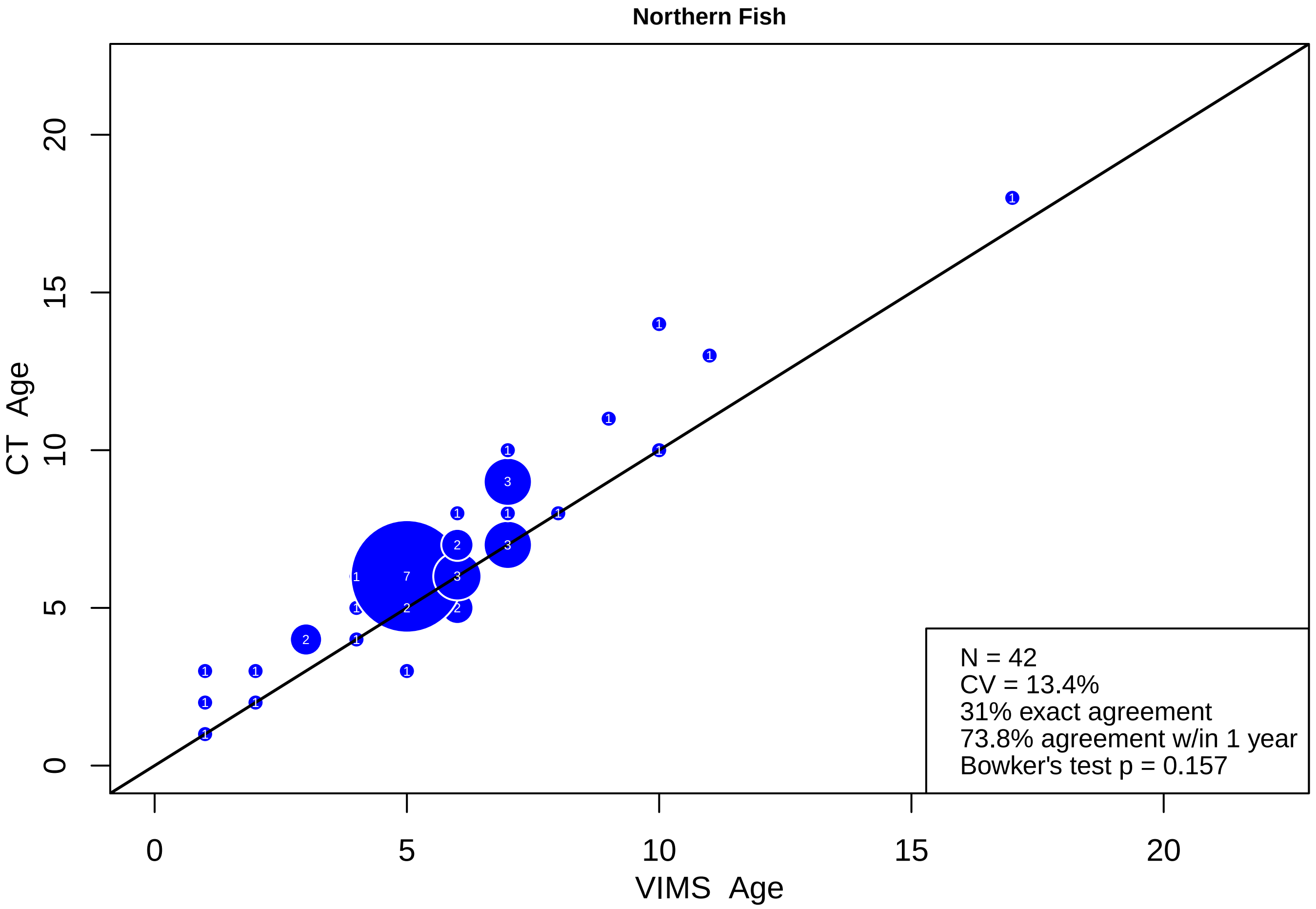


Figure 57: NY vs. VIMS bias plots of operculum ages by region of sample origin.



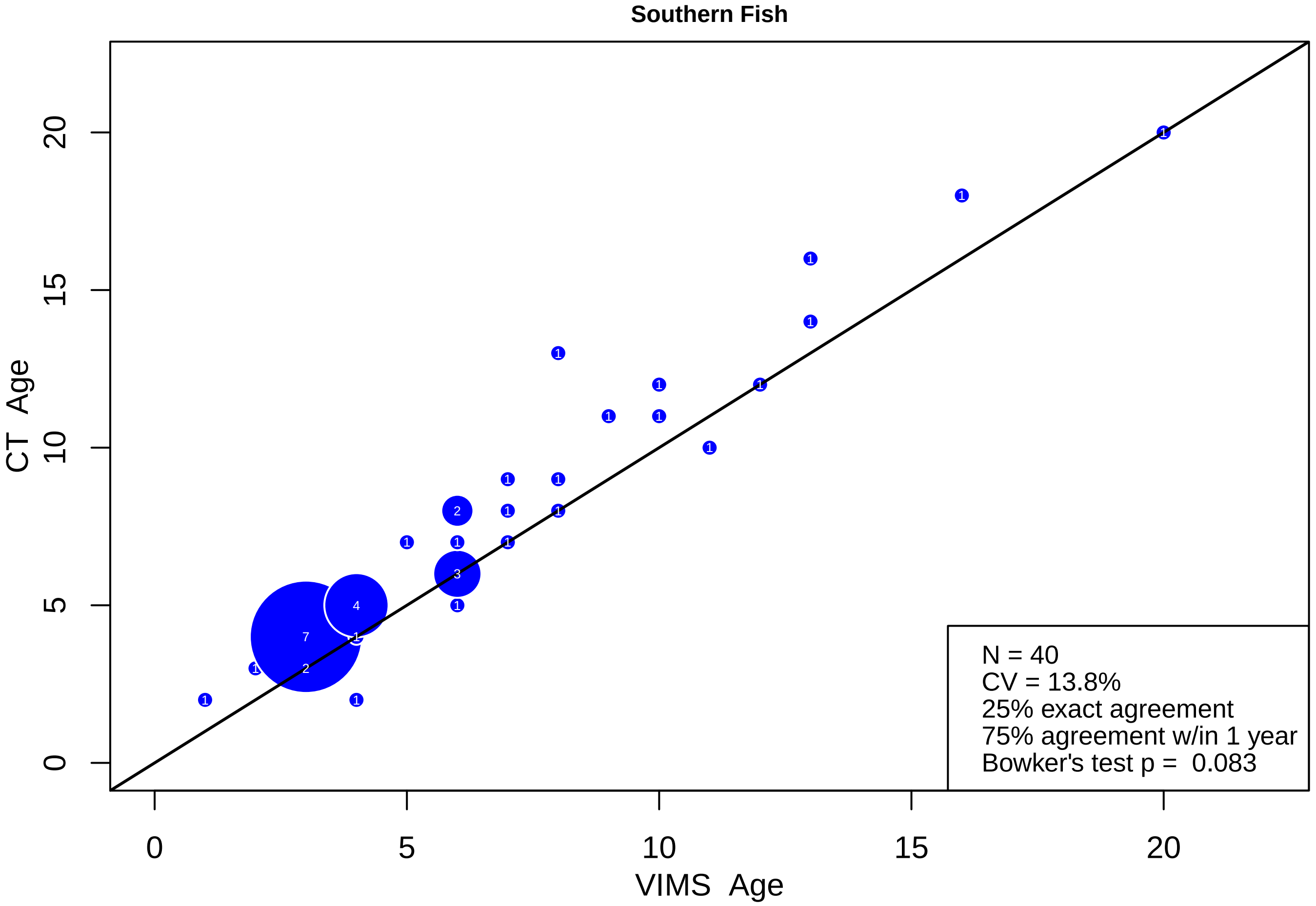
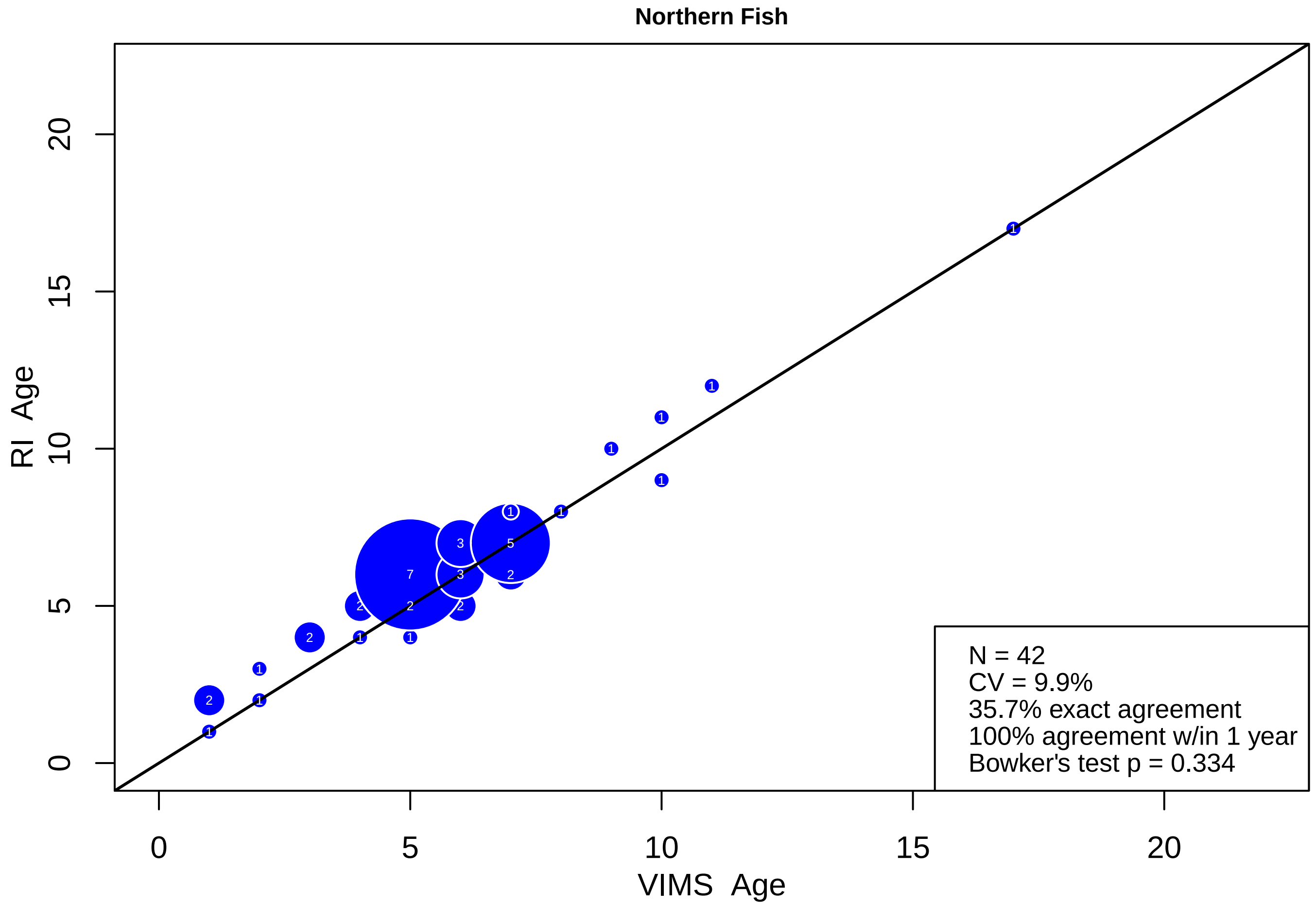


Figure 58: CT vs. VIMS bias plots of operculum ages by region of sample origin.



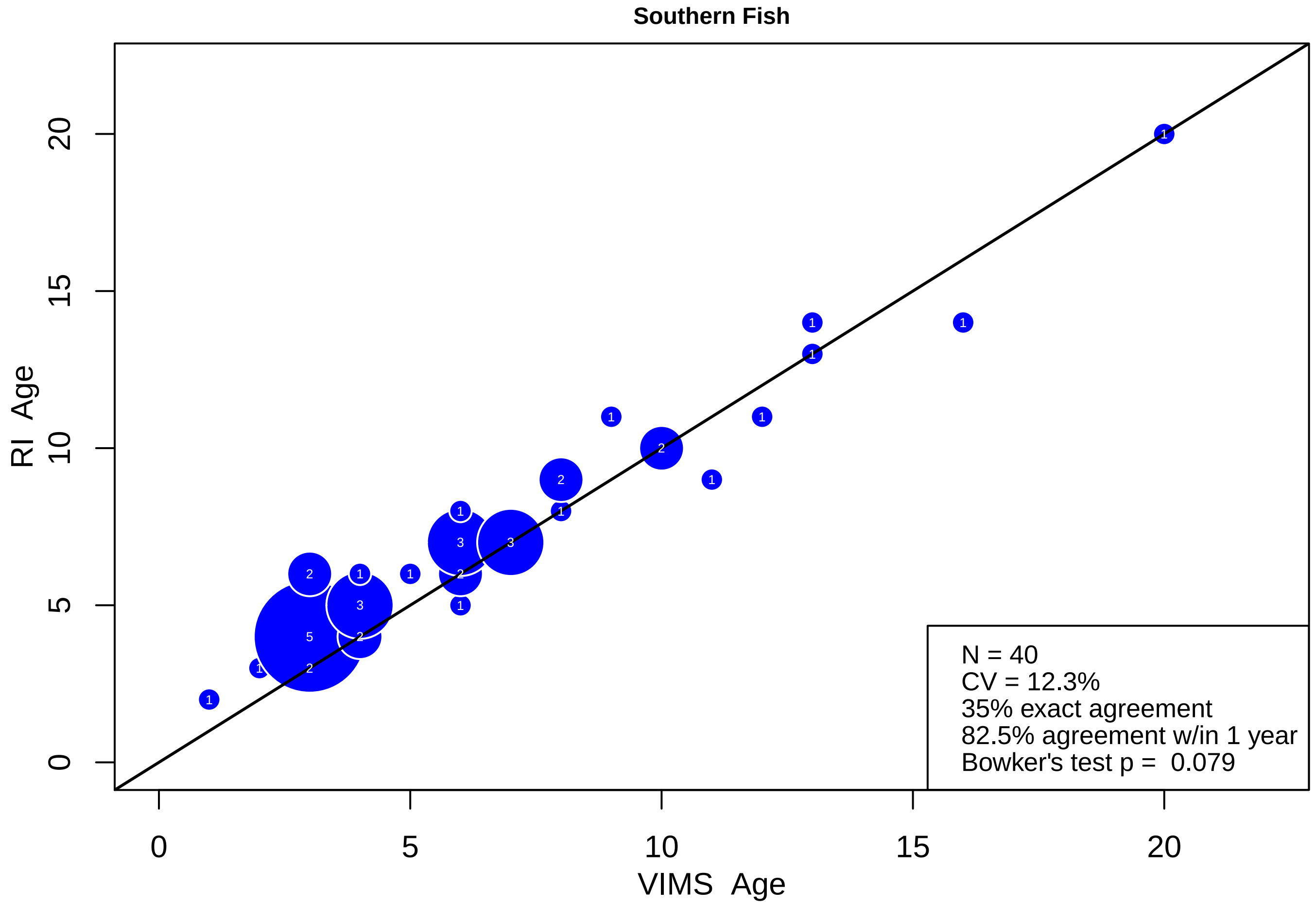
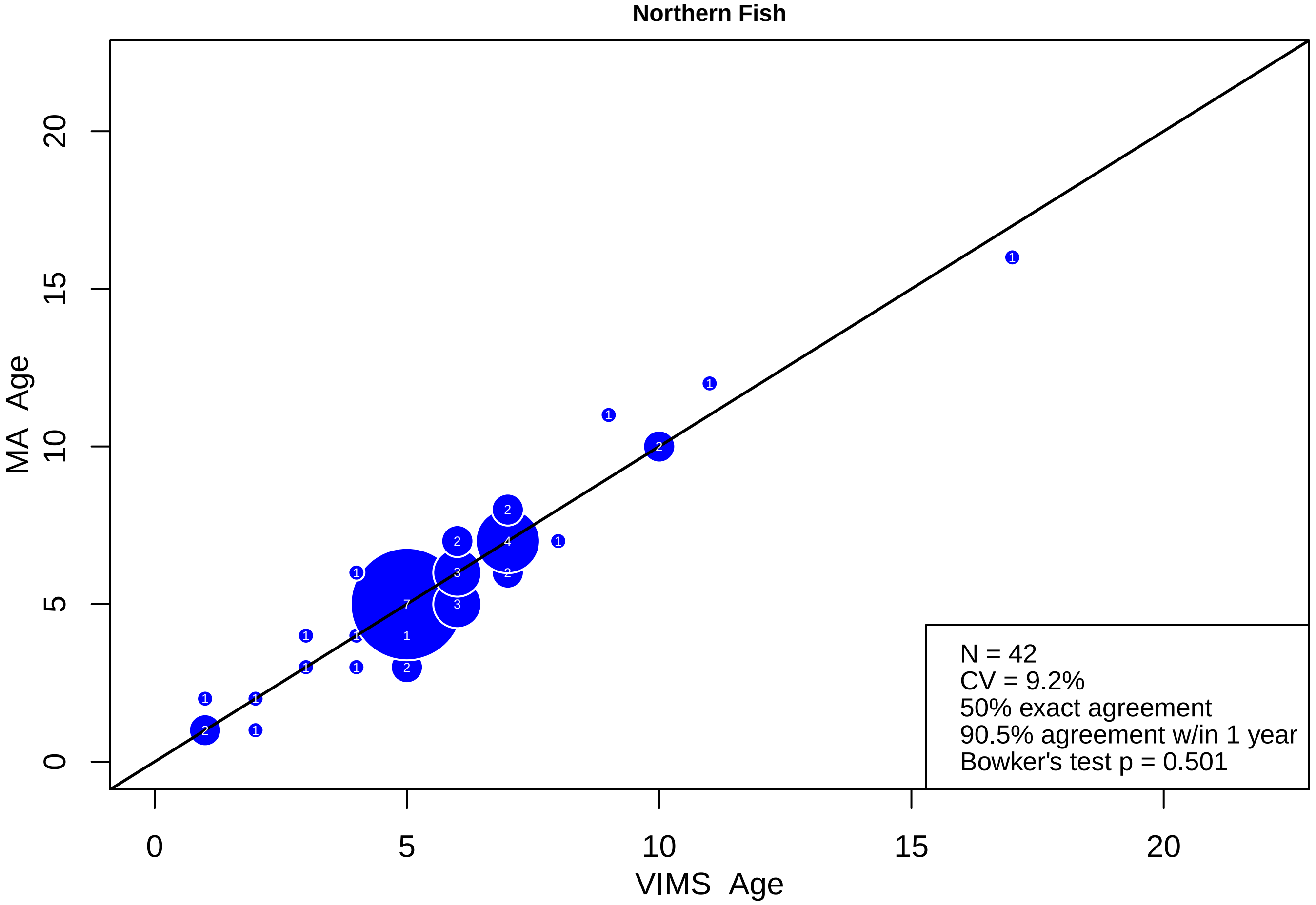


Figure 59: RI vs. VIMS bias plots of operculum ages by region of sample origin.



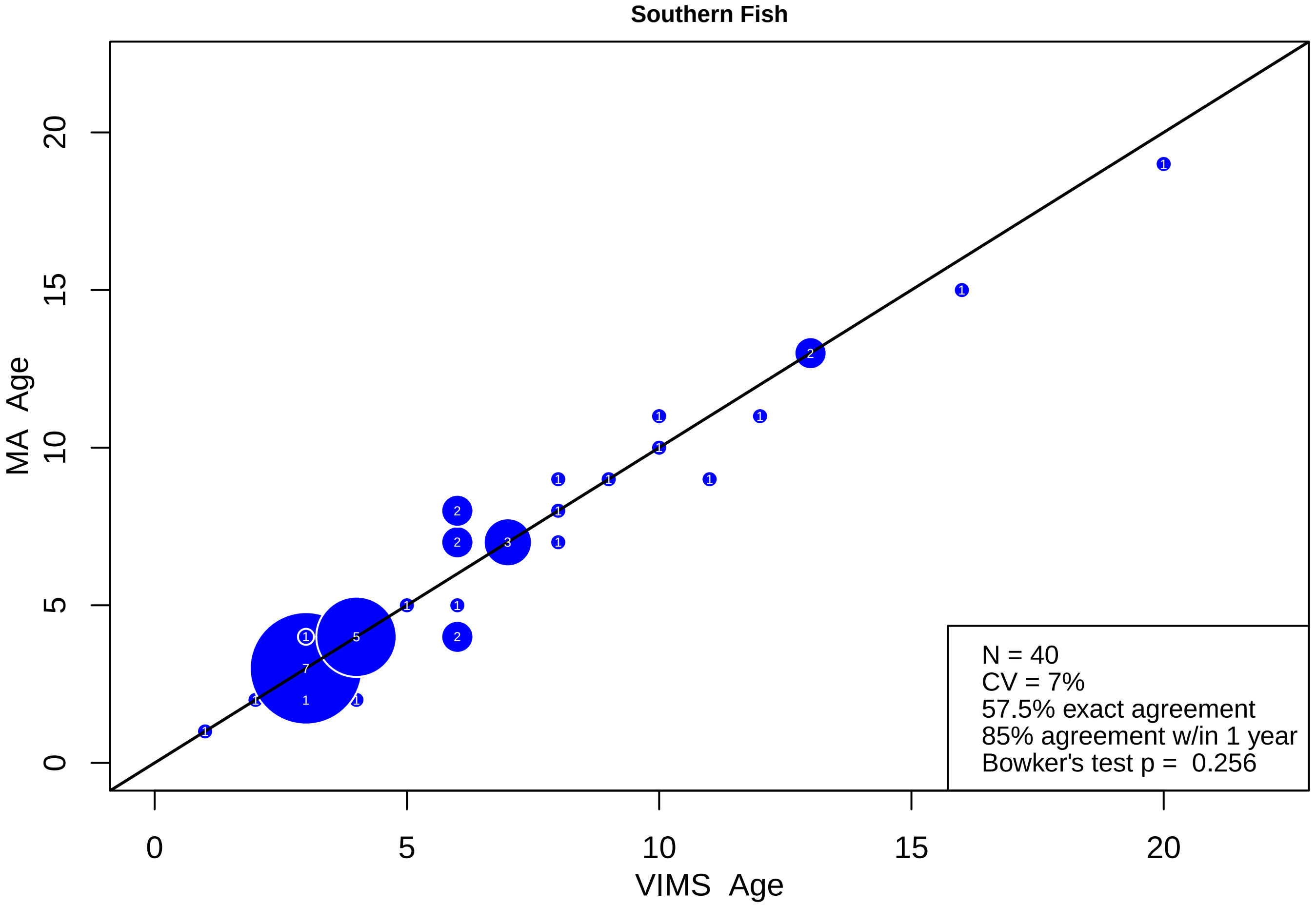
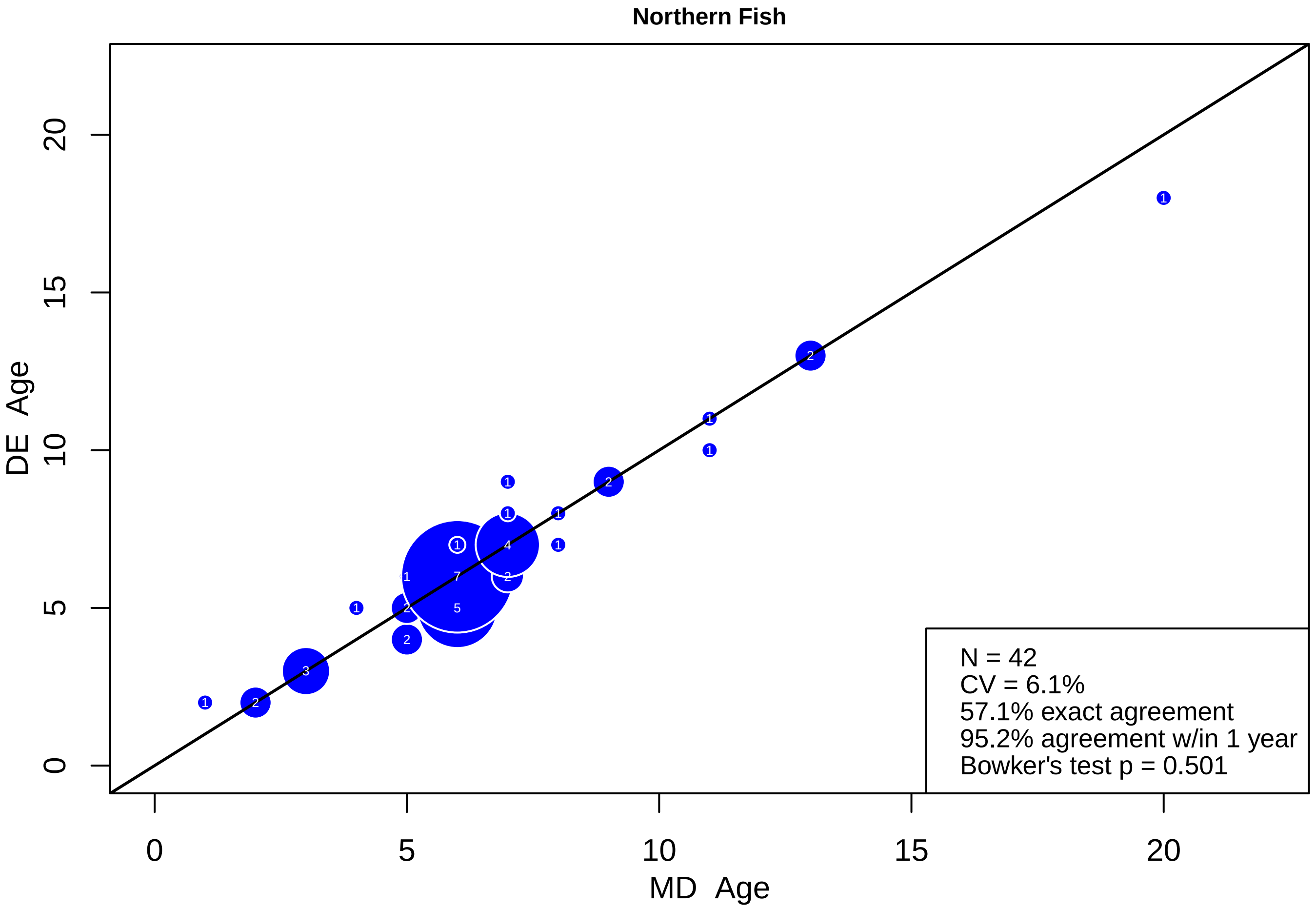


Figure 60: MA vs. VIMS bias plots of operculum ages by region of sample origin.



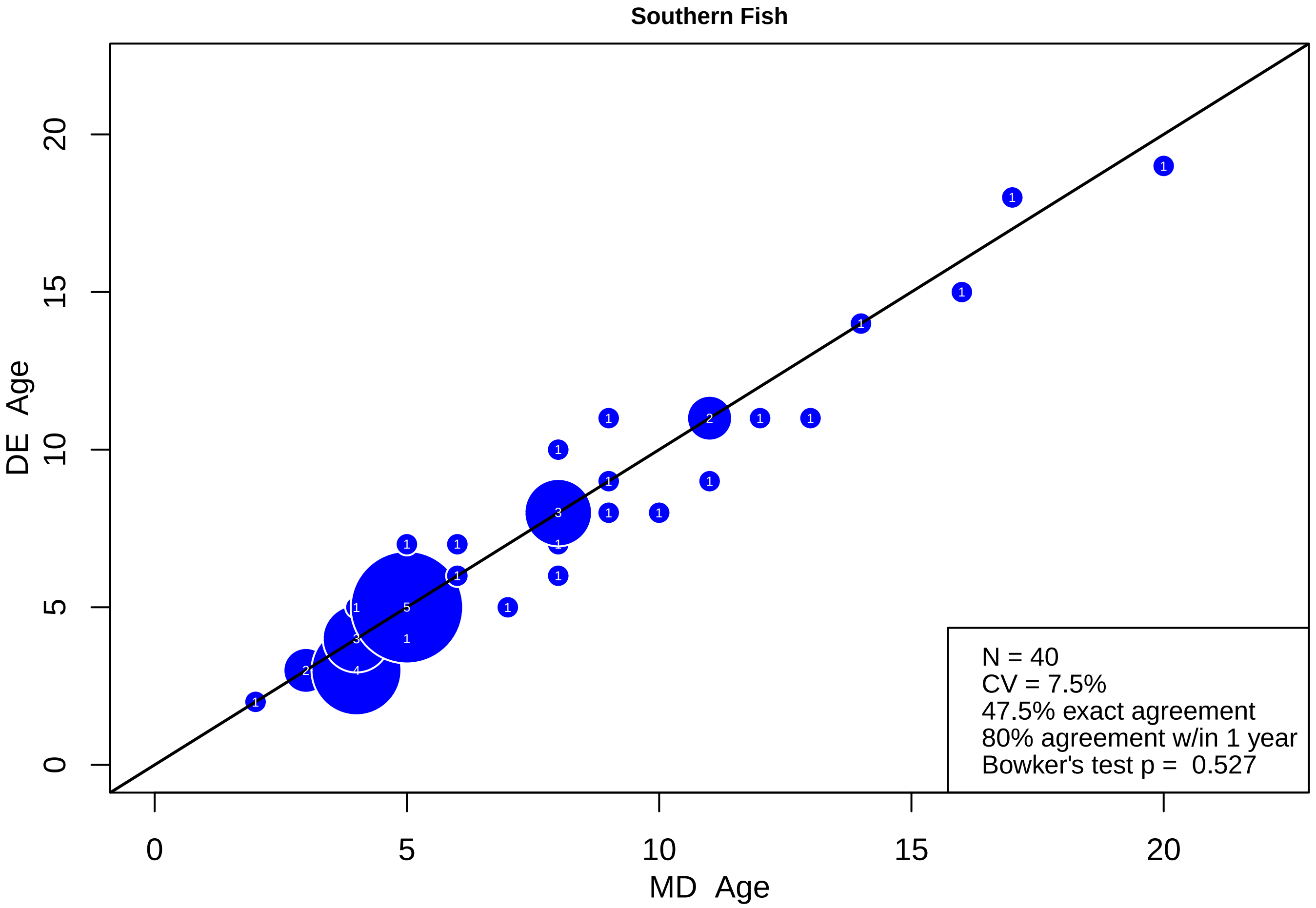
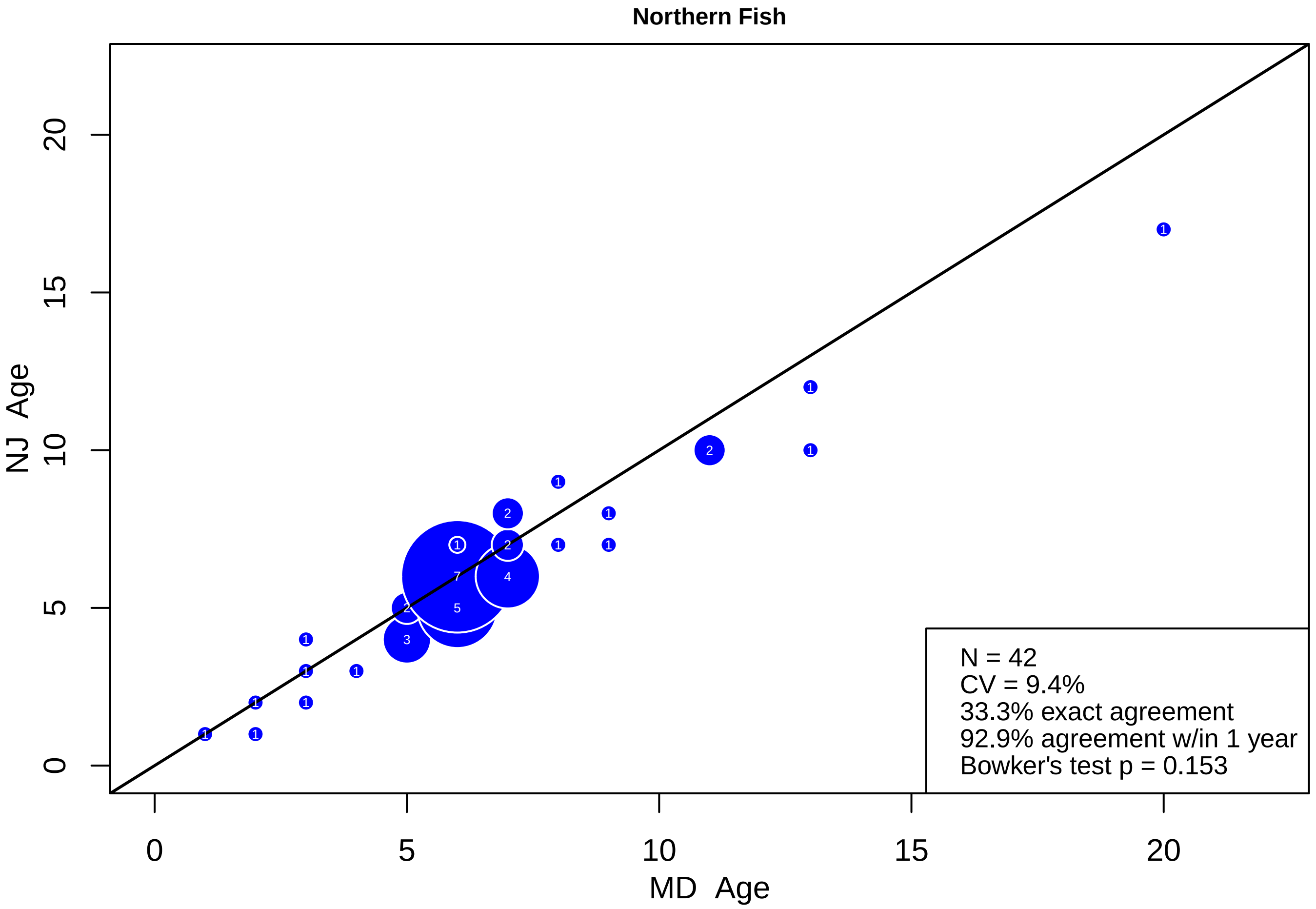


Figure 61: DE vs. MD bias plots of operculum ages by region of sample origin.



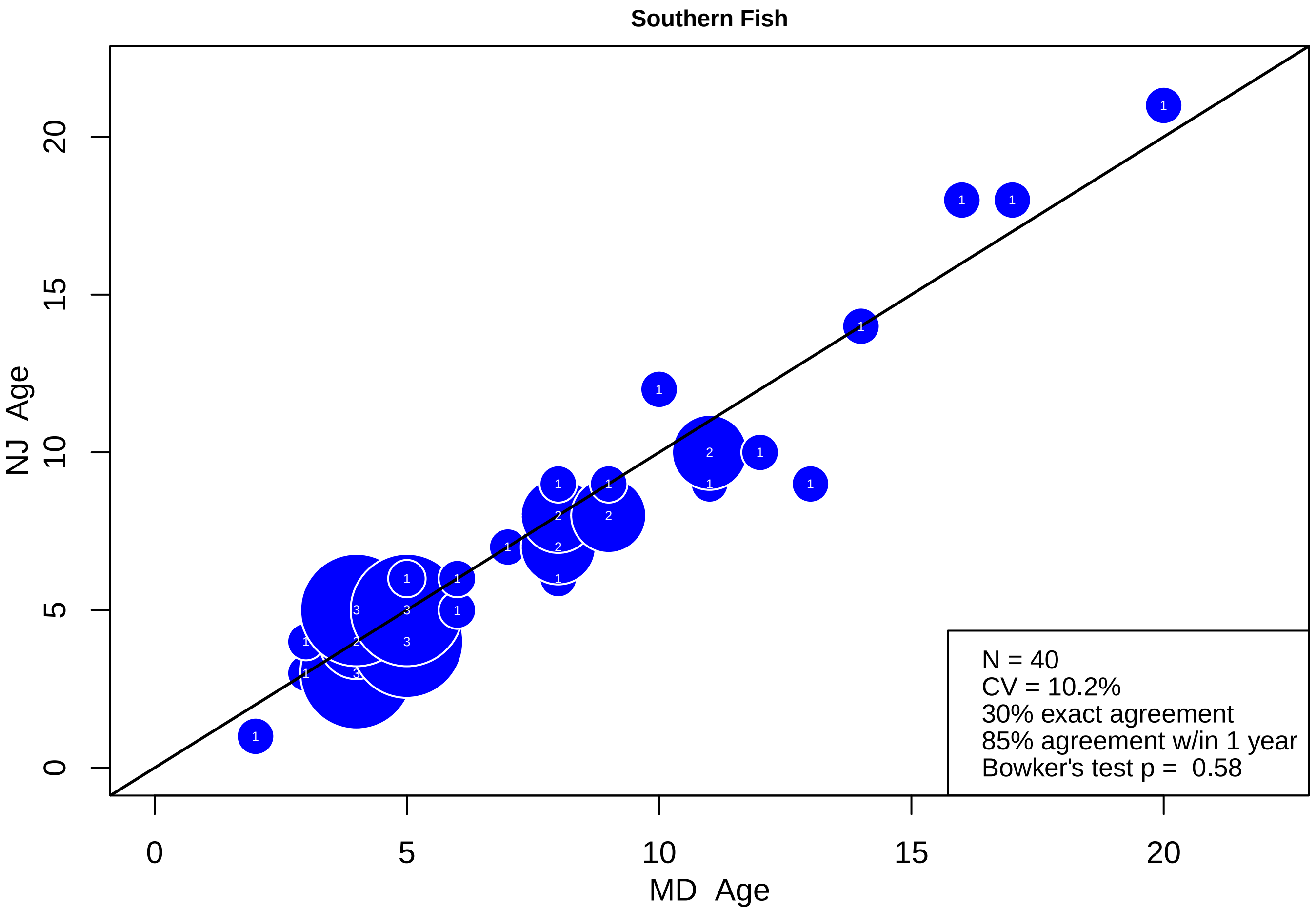
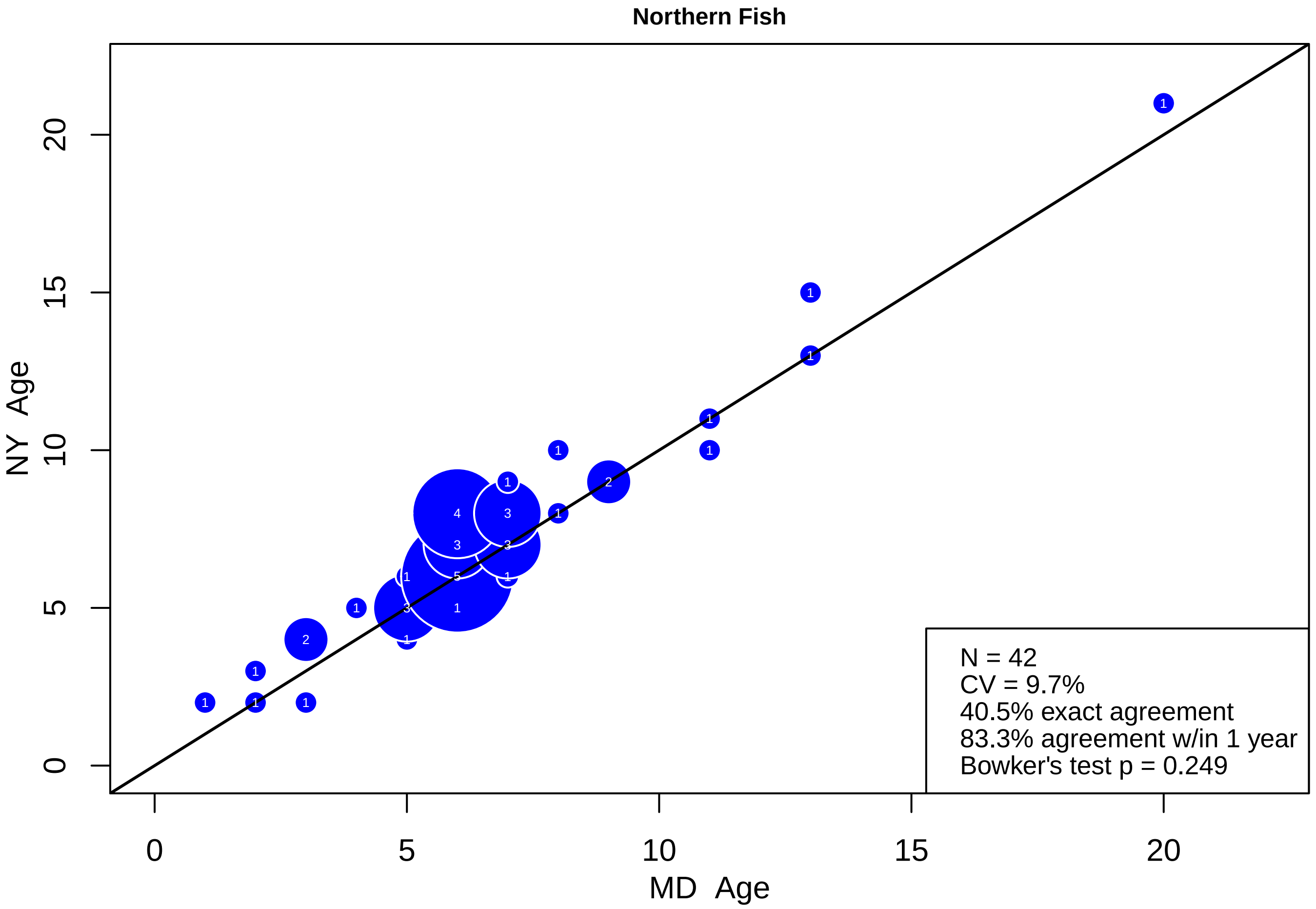


Figure 62: NJ vs. MD bias plots of operculum ages by region of sample origin.



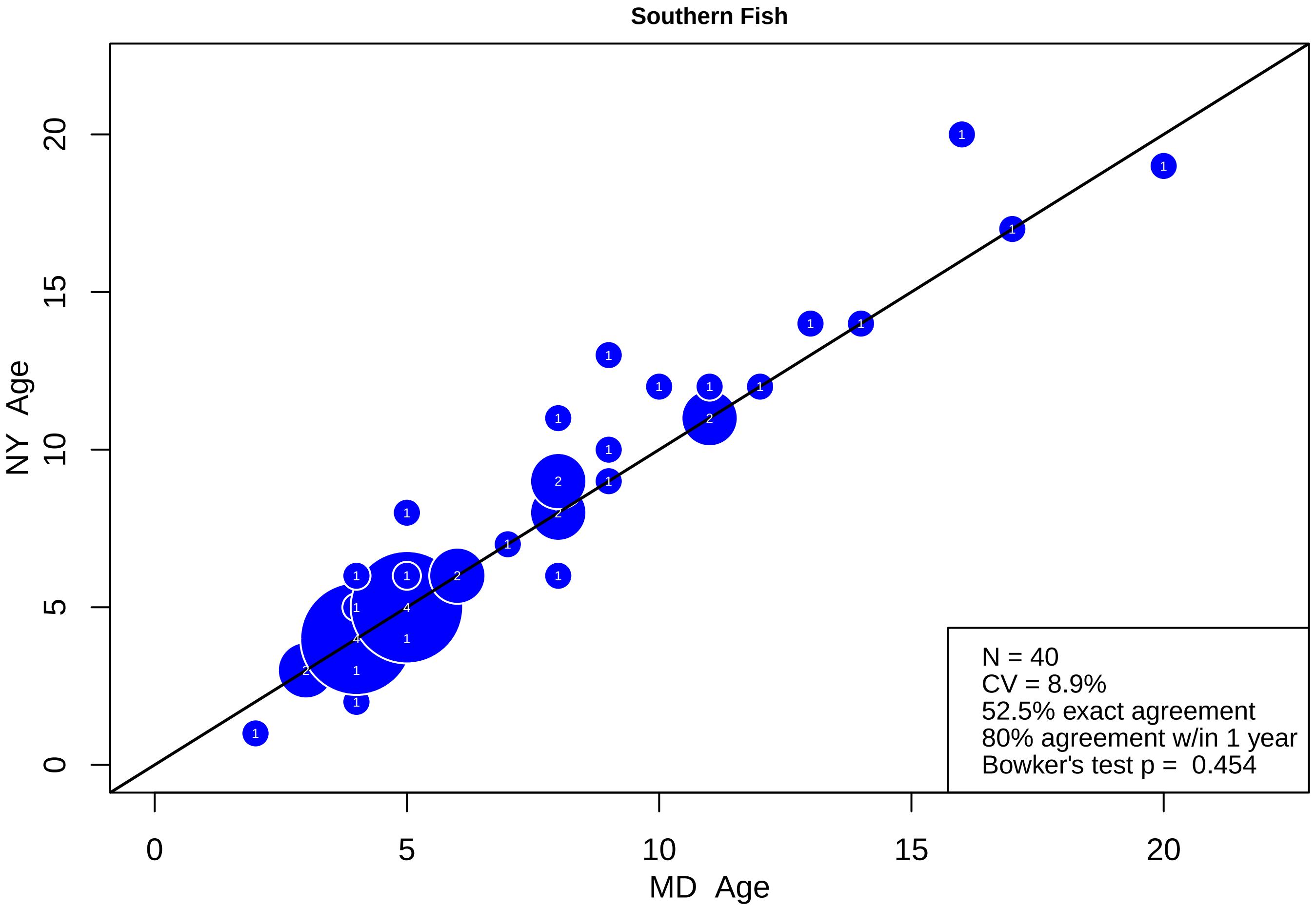


Figure 63: NY vs. MD bias plots of operculum ages by region of sample origin.

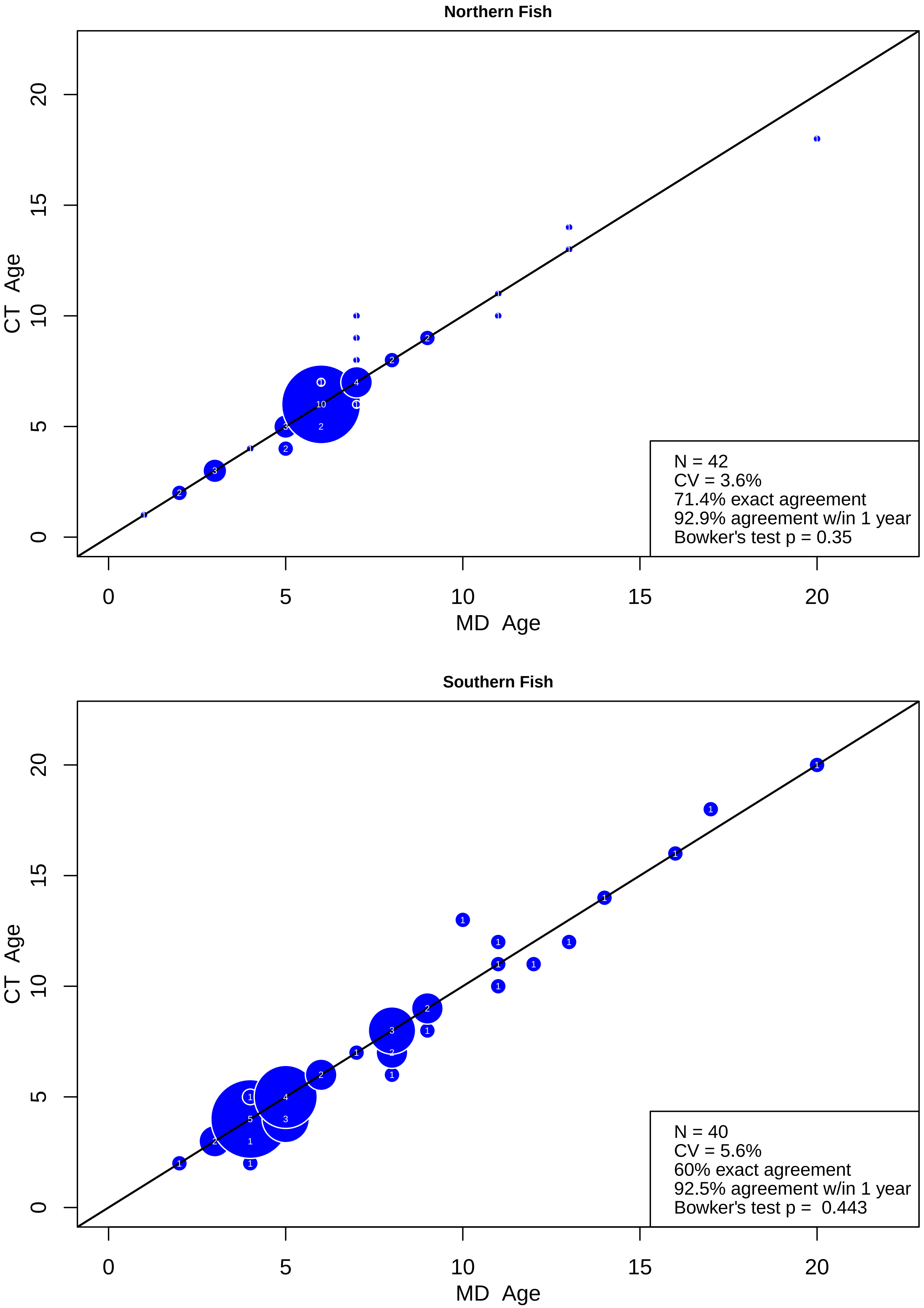
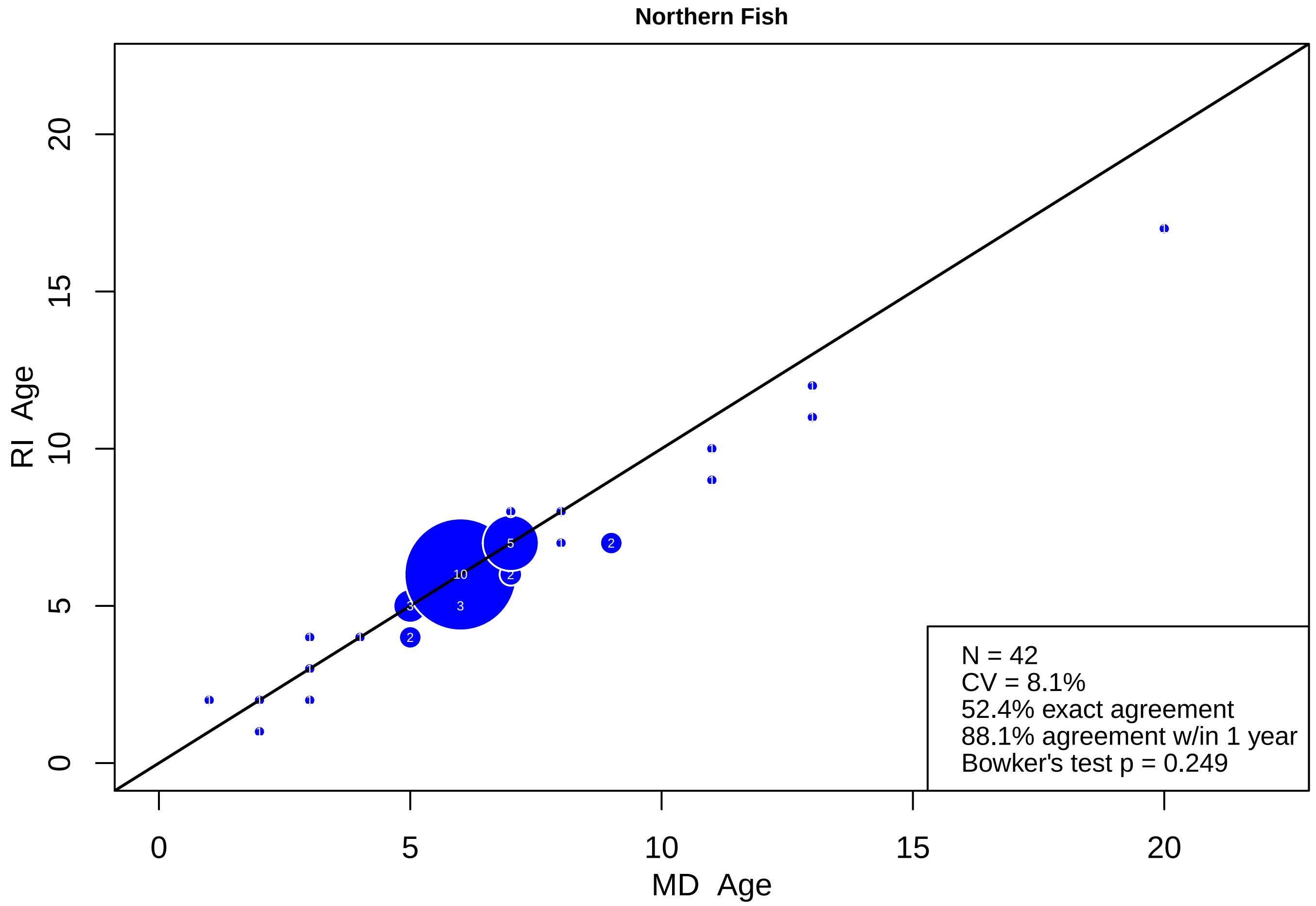


Figure 64: CT vs. MD bias plots of operculum ages by region of sample origin.



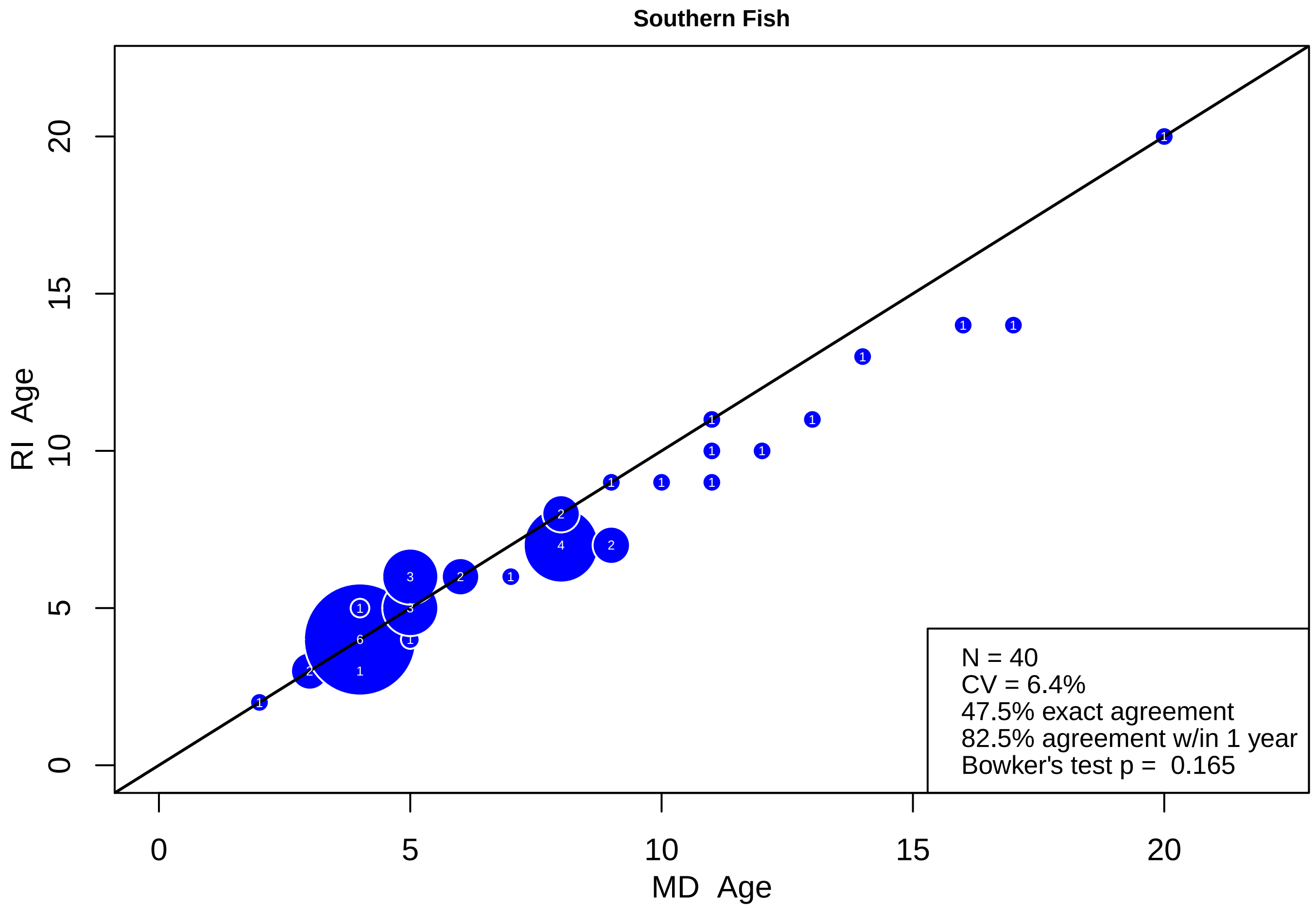
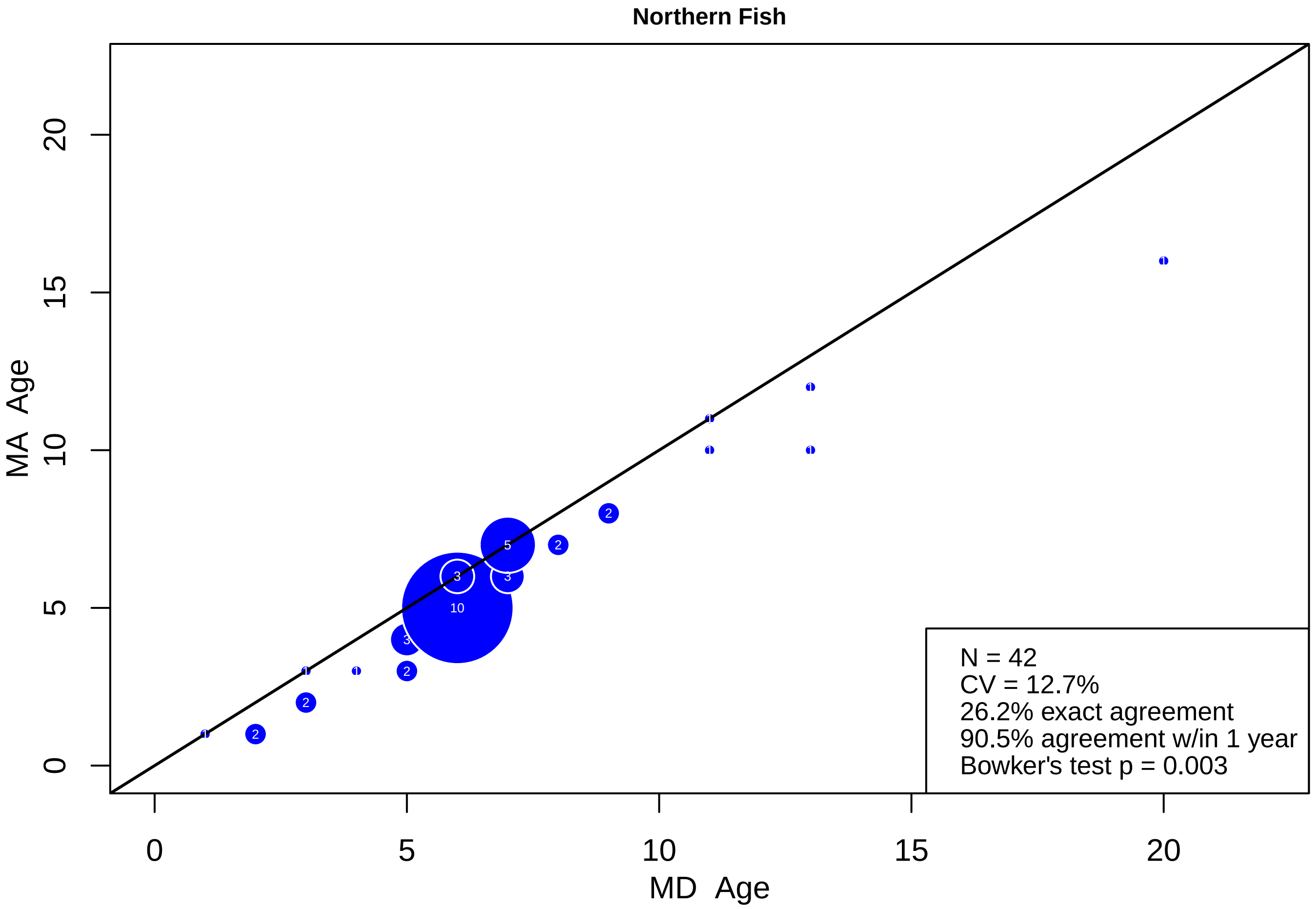


Figure 65: RI vs. MD bias plots of operculum ages by region of sample origin.



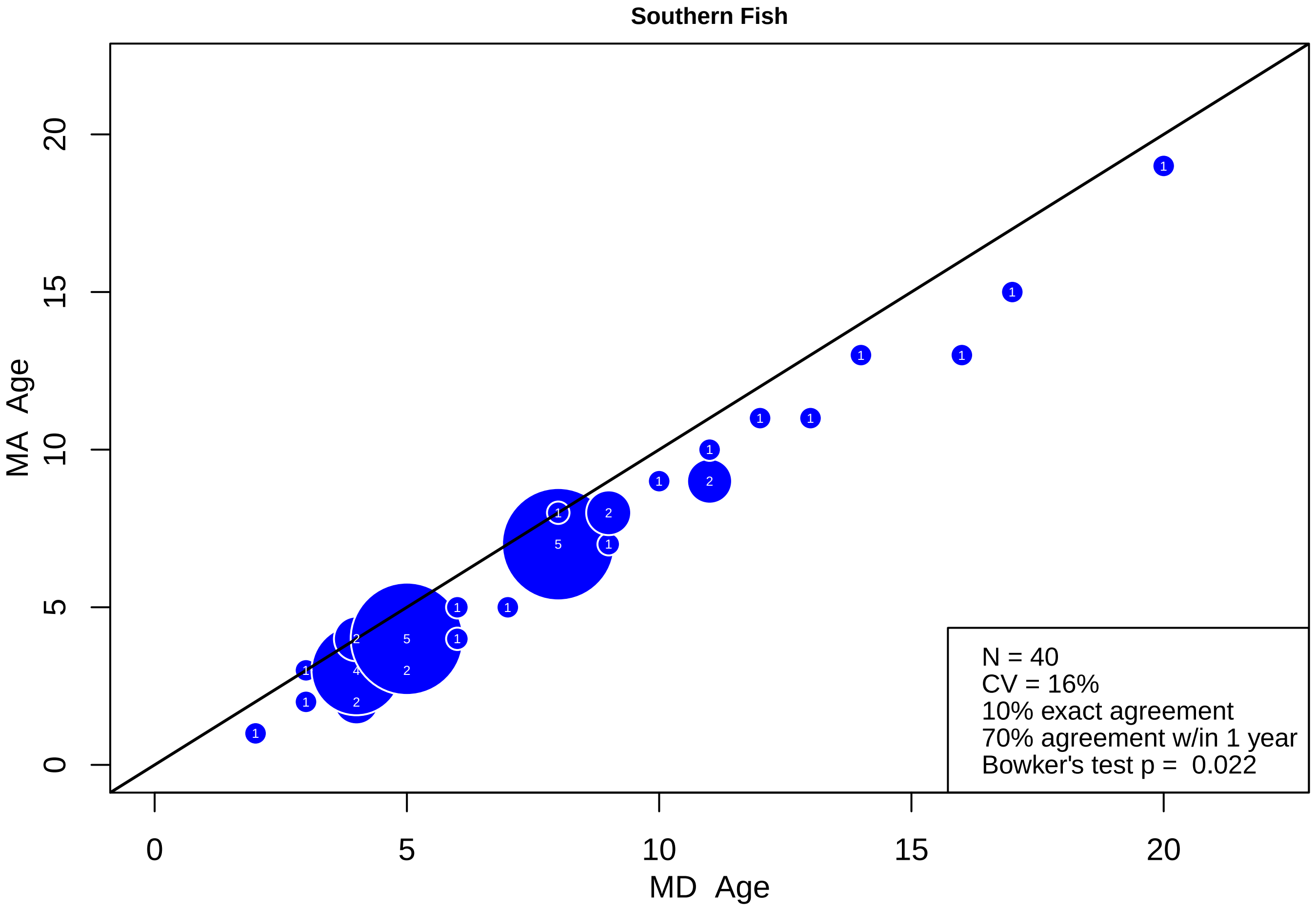
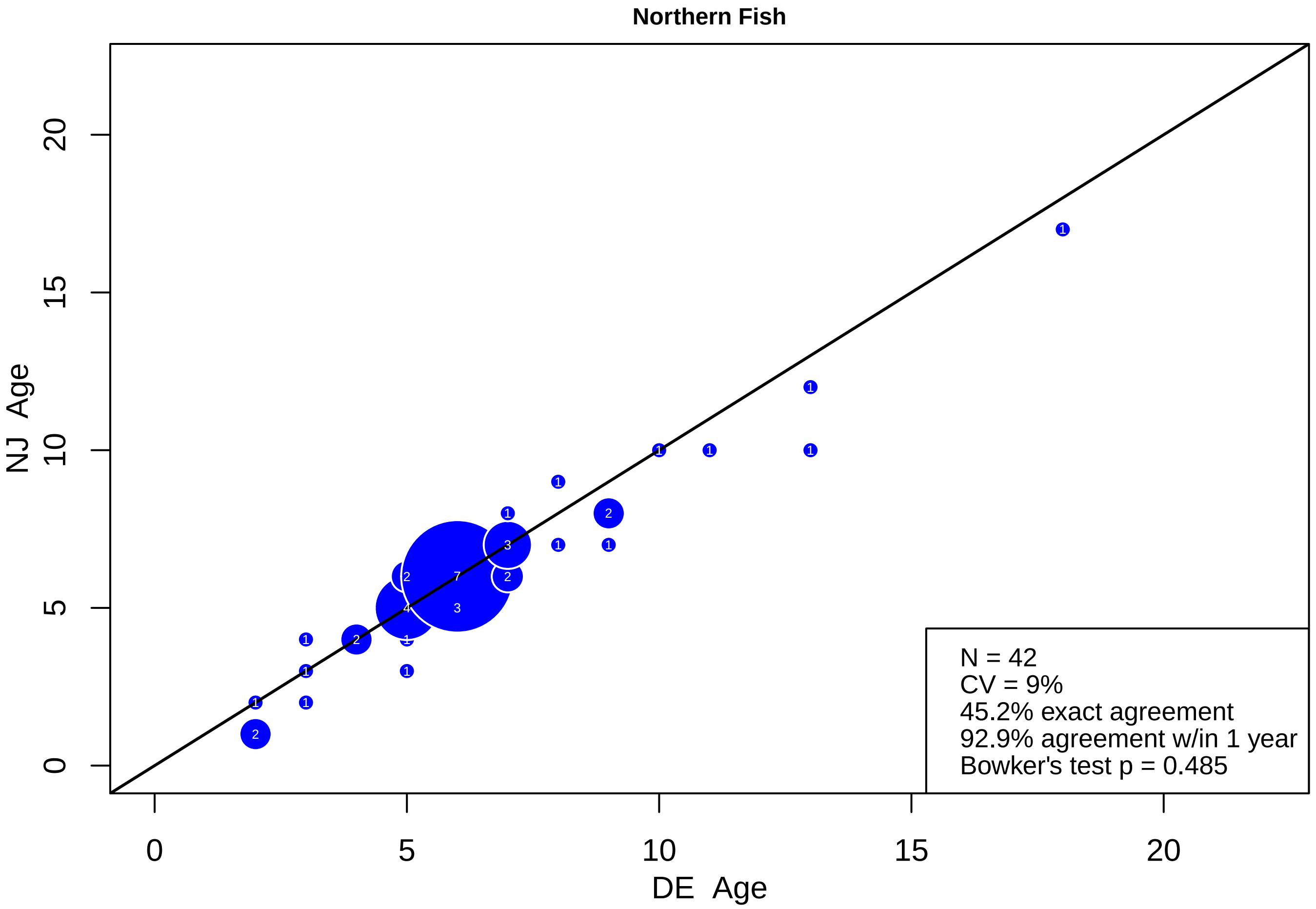


Figure 66: MA vs. MD bias plots of operculum ages by region of sample origin.



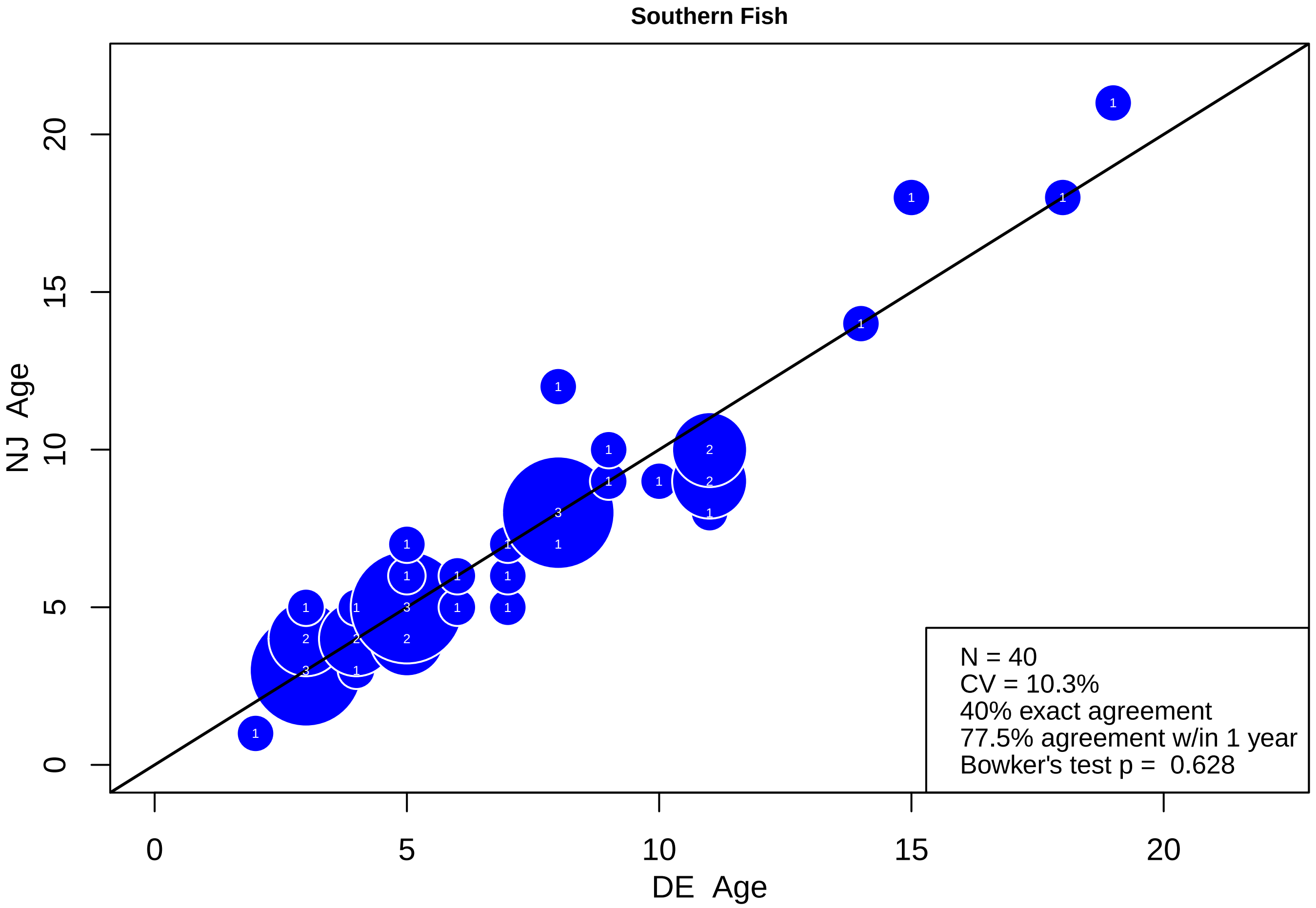


Figure 67: NJ vs. DE bias plots of operculum ages by region of sample origin.

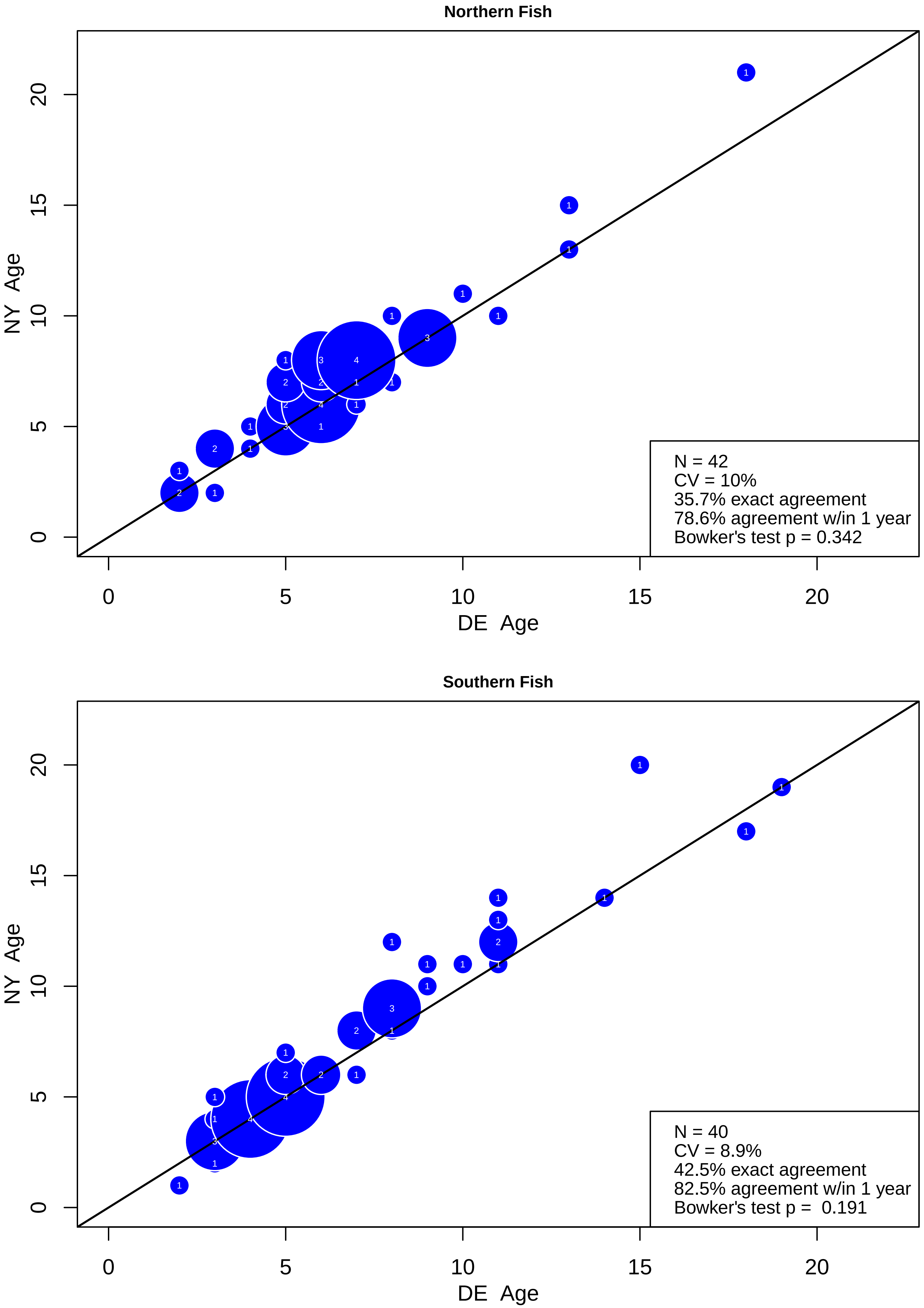


Figure 68: NY vs. DE bias plots of operculum ages by region of sample origin.

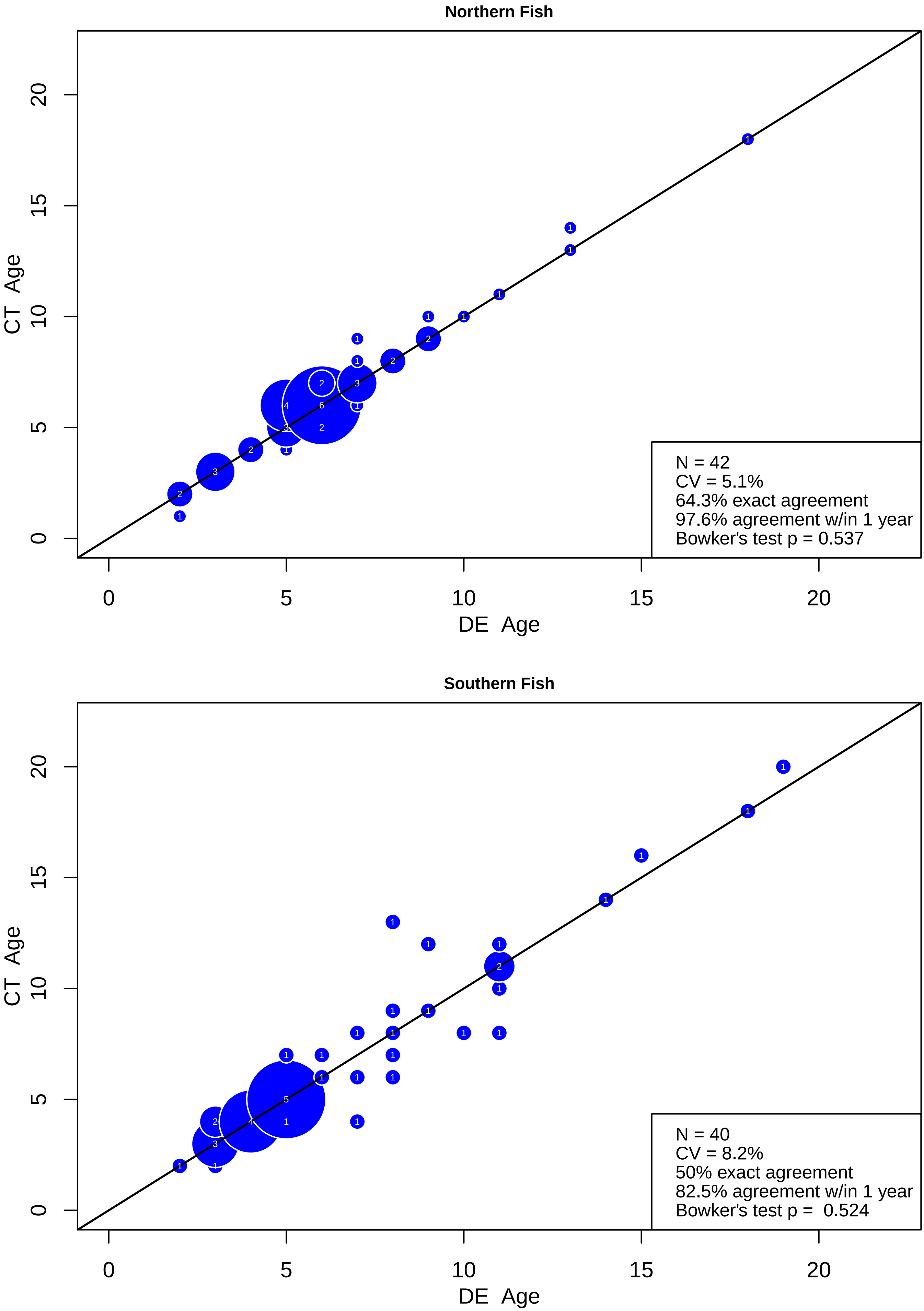
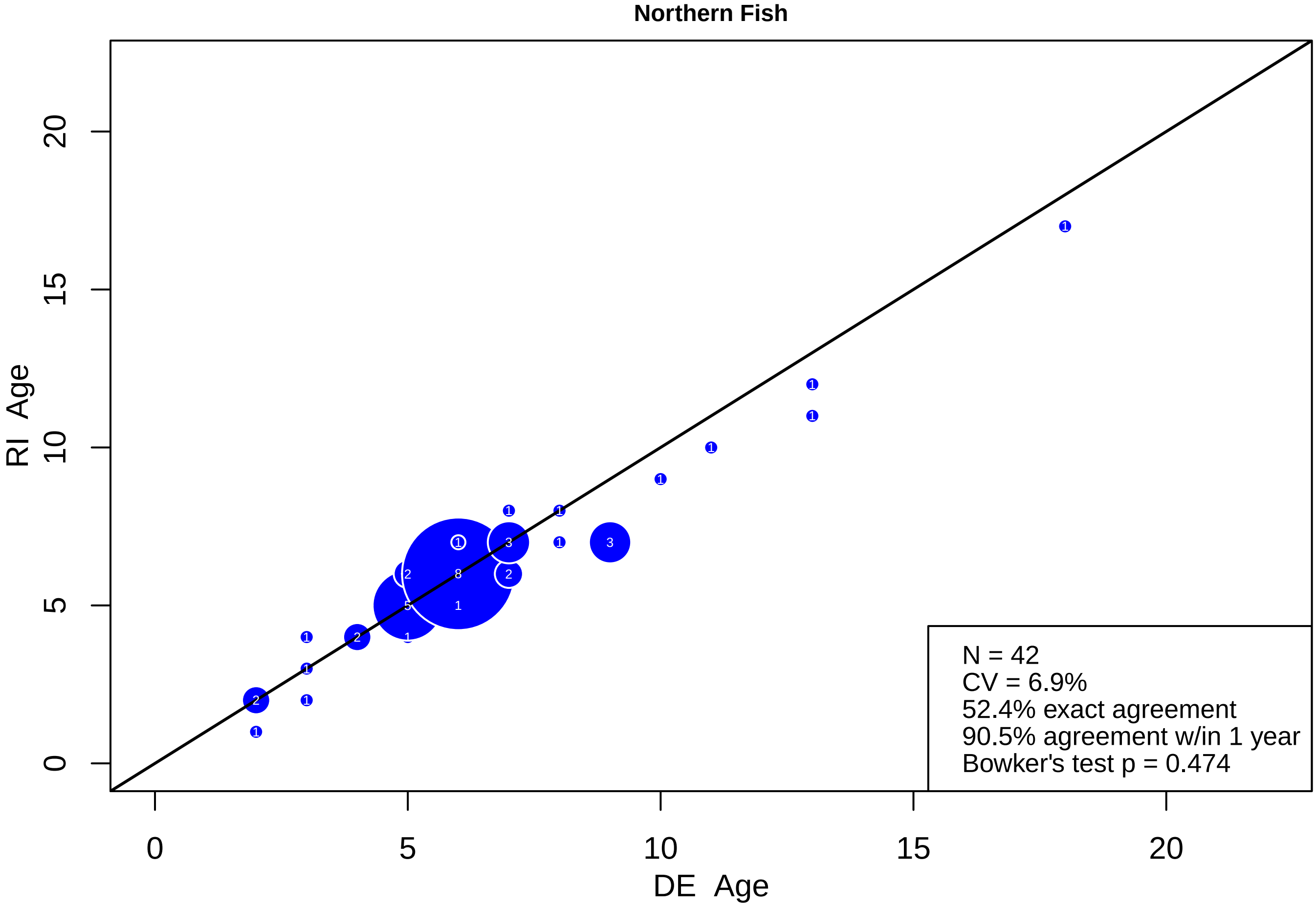


Figure 69: CT vs. DE bias plots of operculum ages by region of sample origin.



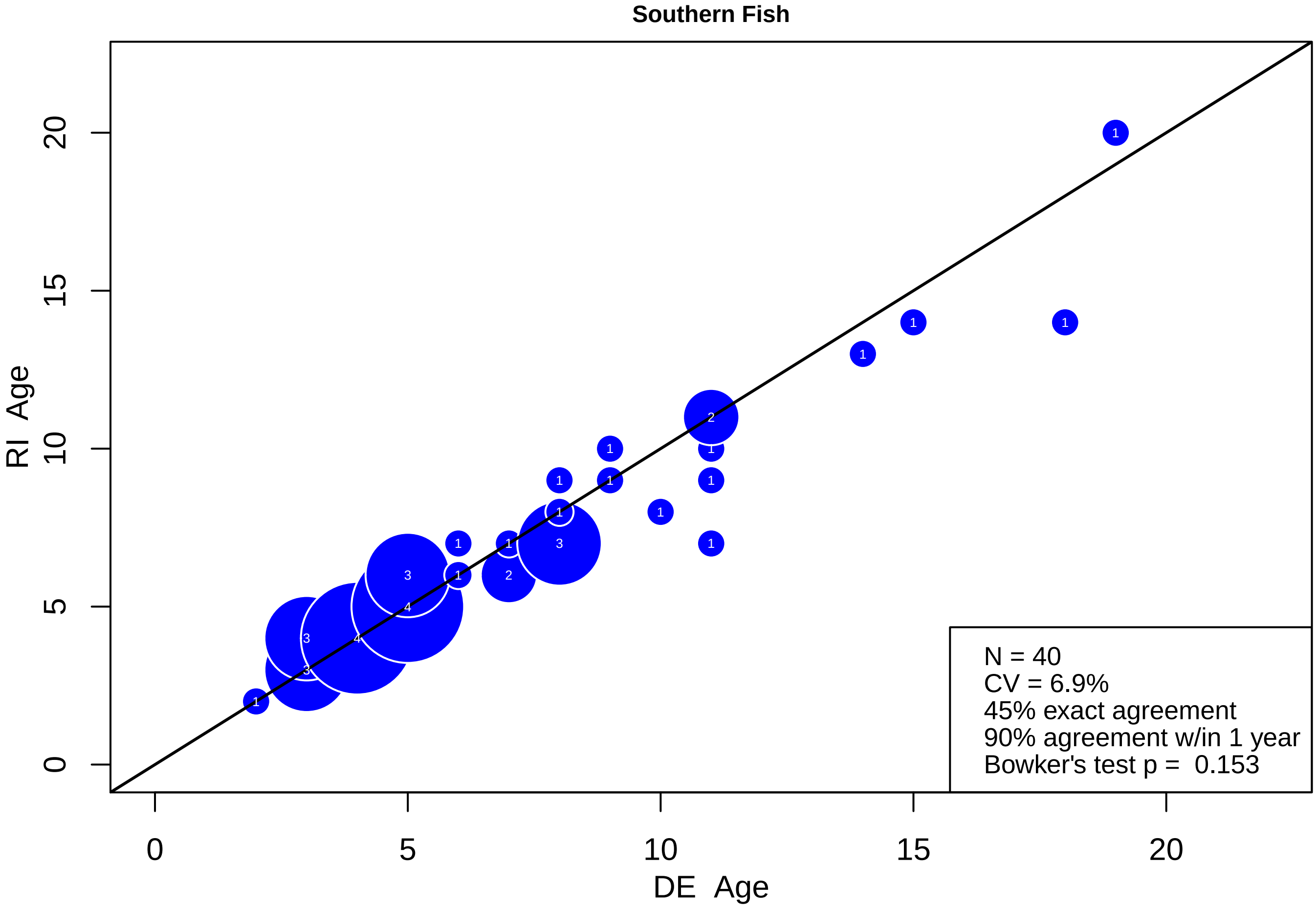
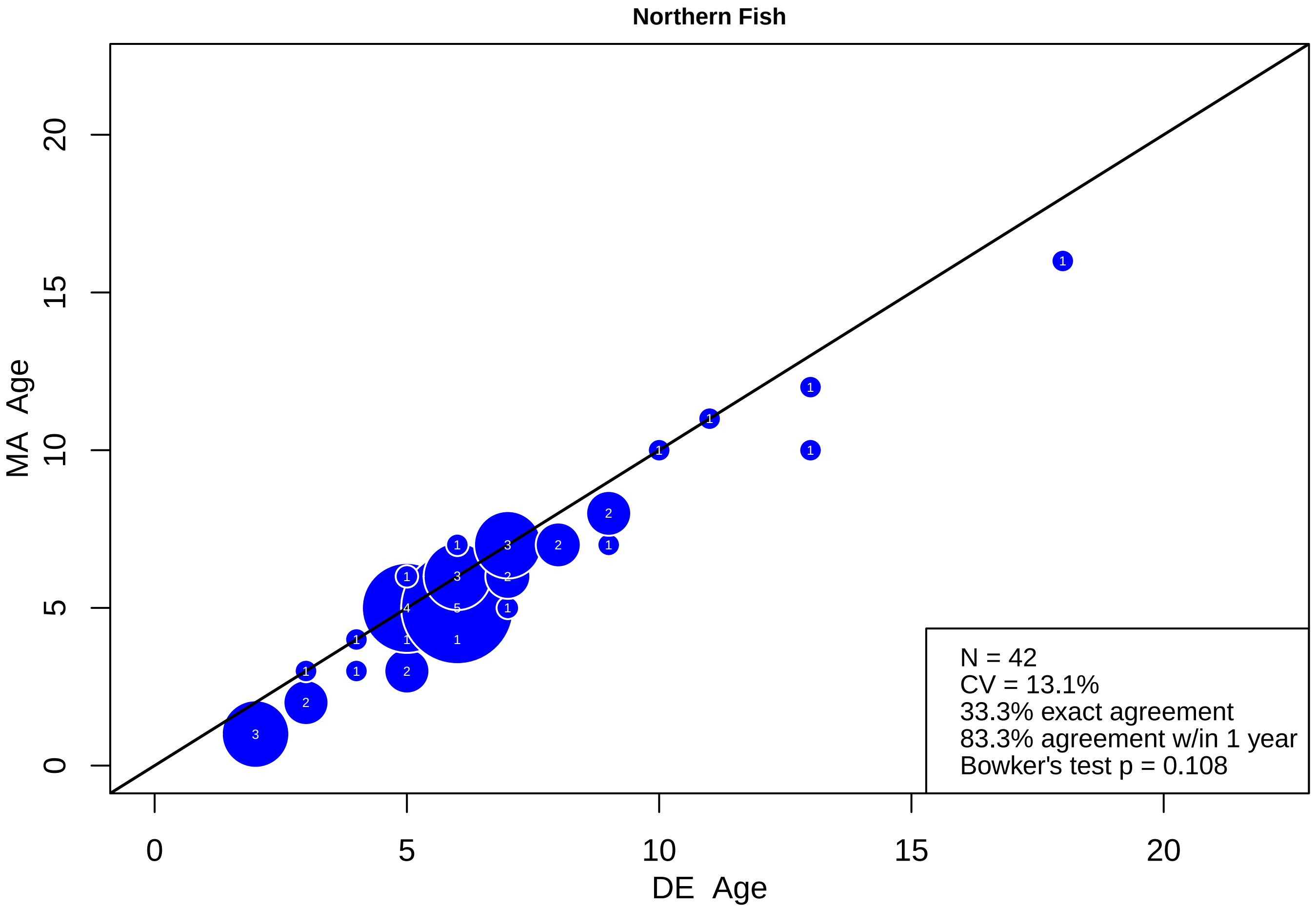


Figure 70: RI vs. DE bias plots of operculum ages by region of sample origin.



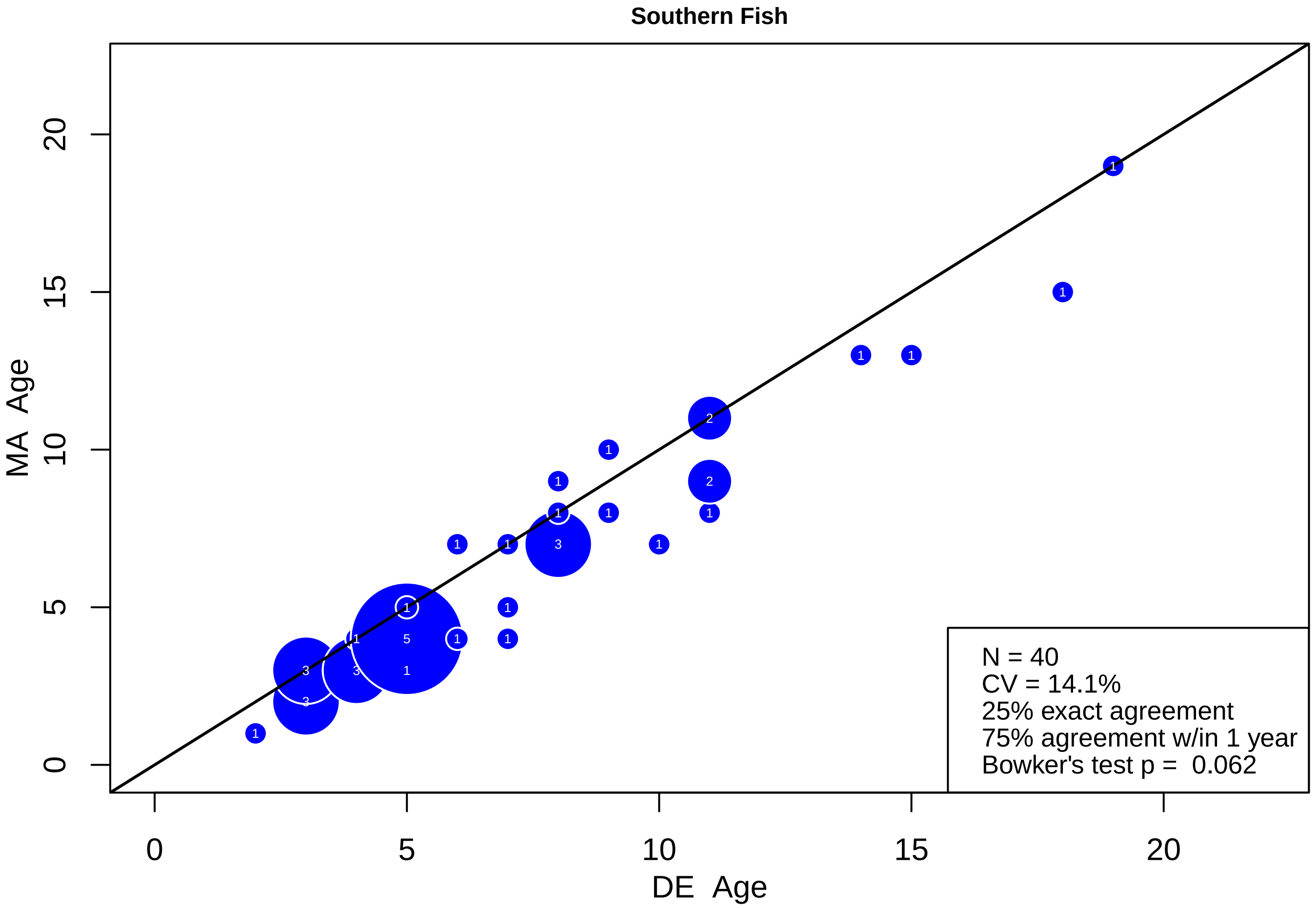


Figure 71: MA vs. DE bias plots of operculum ages by region of sample origin.

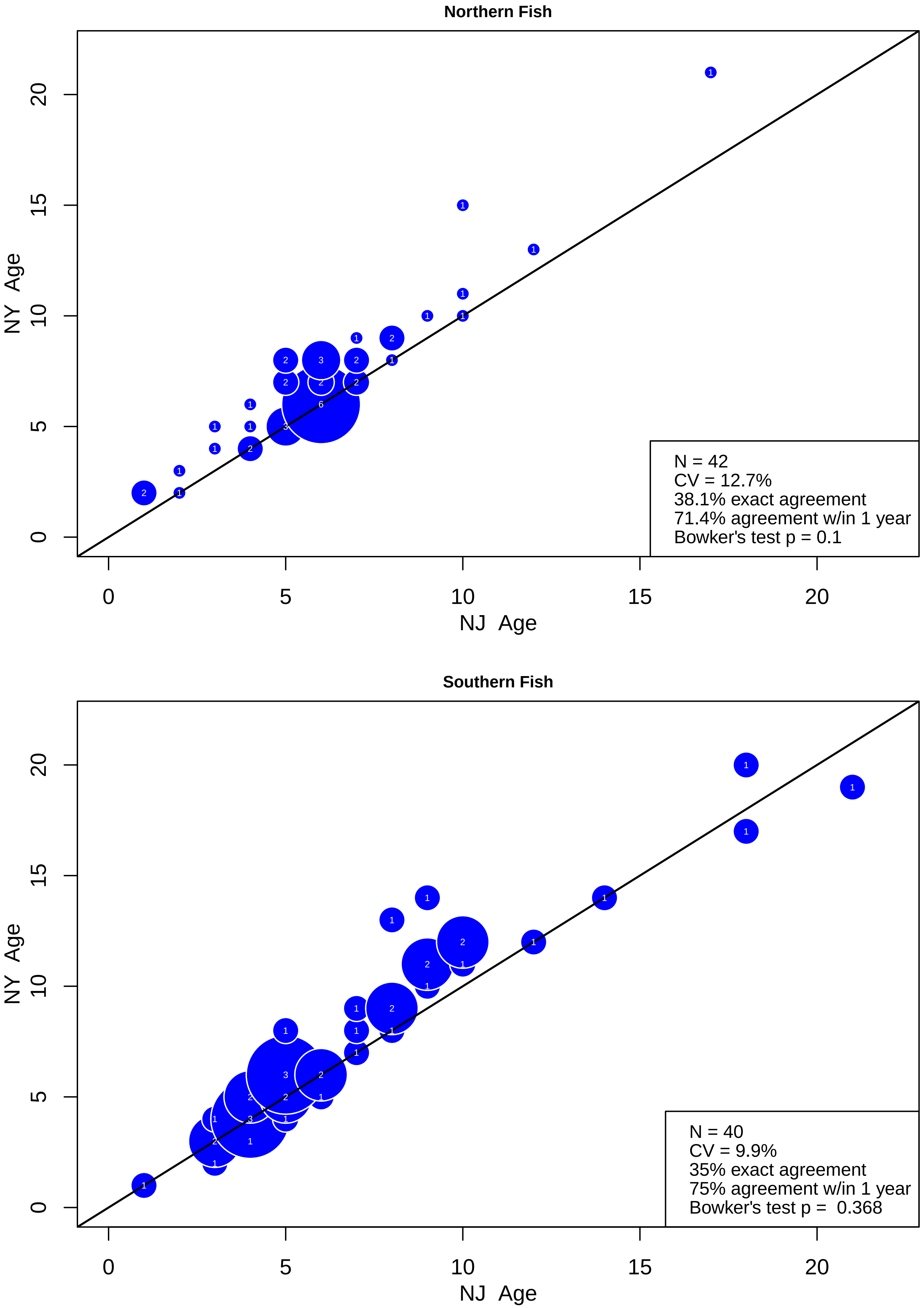


Figure 72: NY vs. NJ bias plots of operculum ages by region of sample origin.

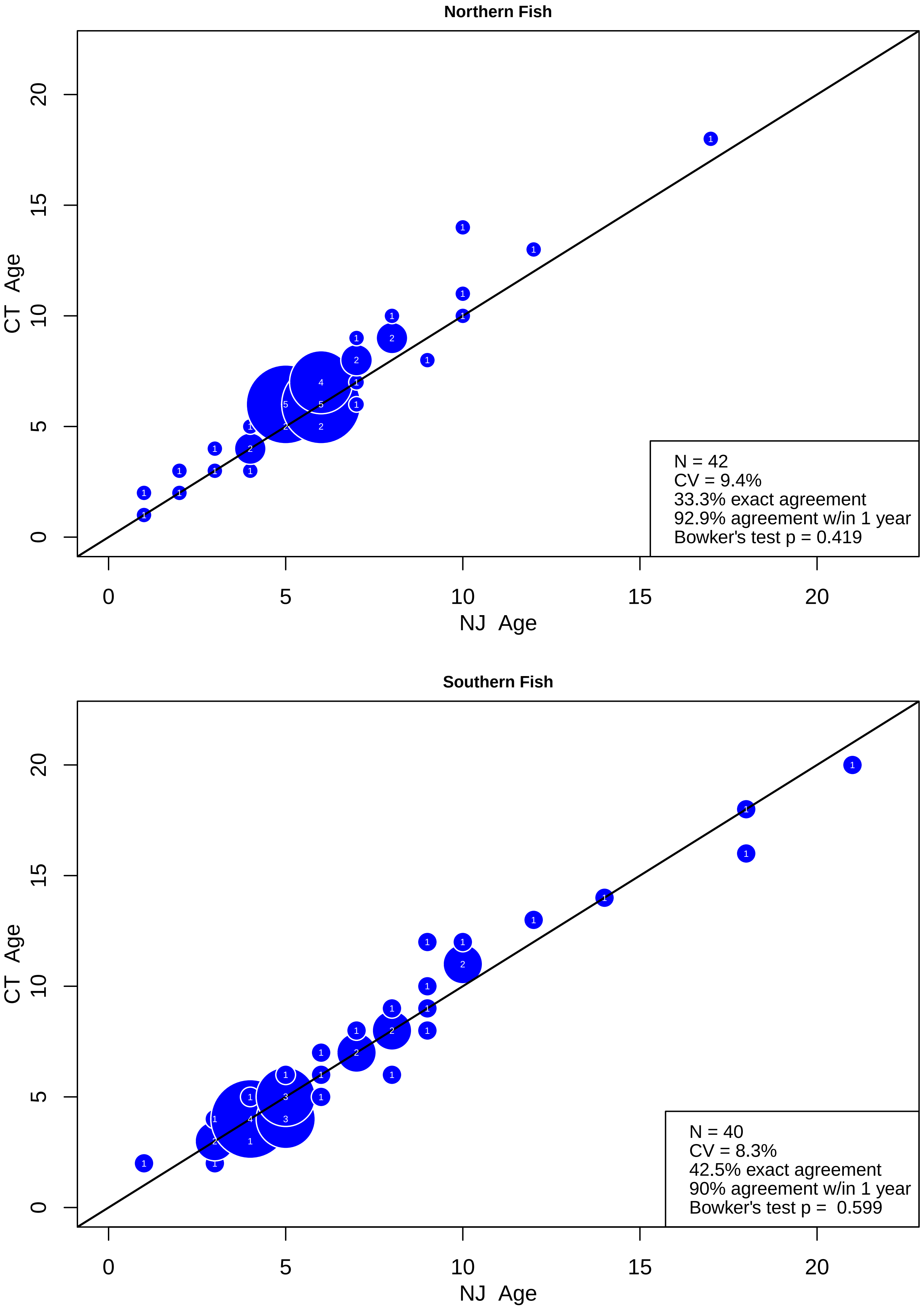


Figure 73: CT vs. NJ bias plots of operculum ages by region of sample origin.

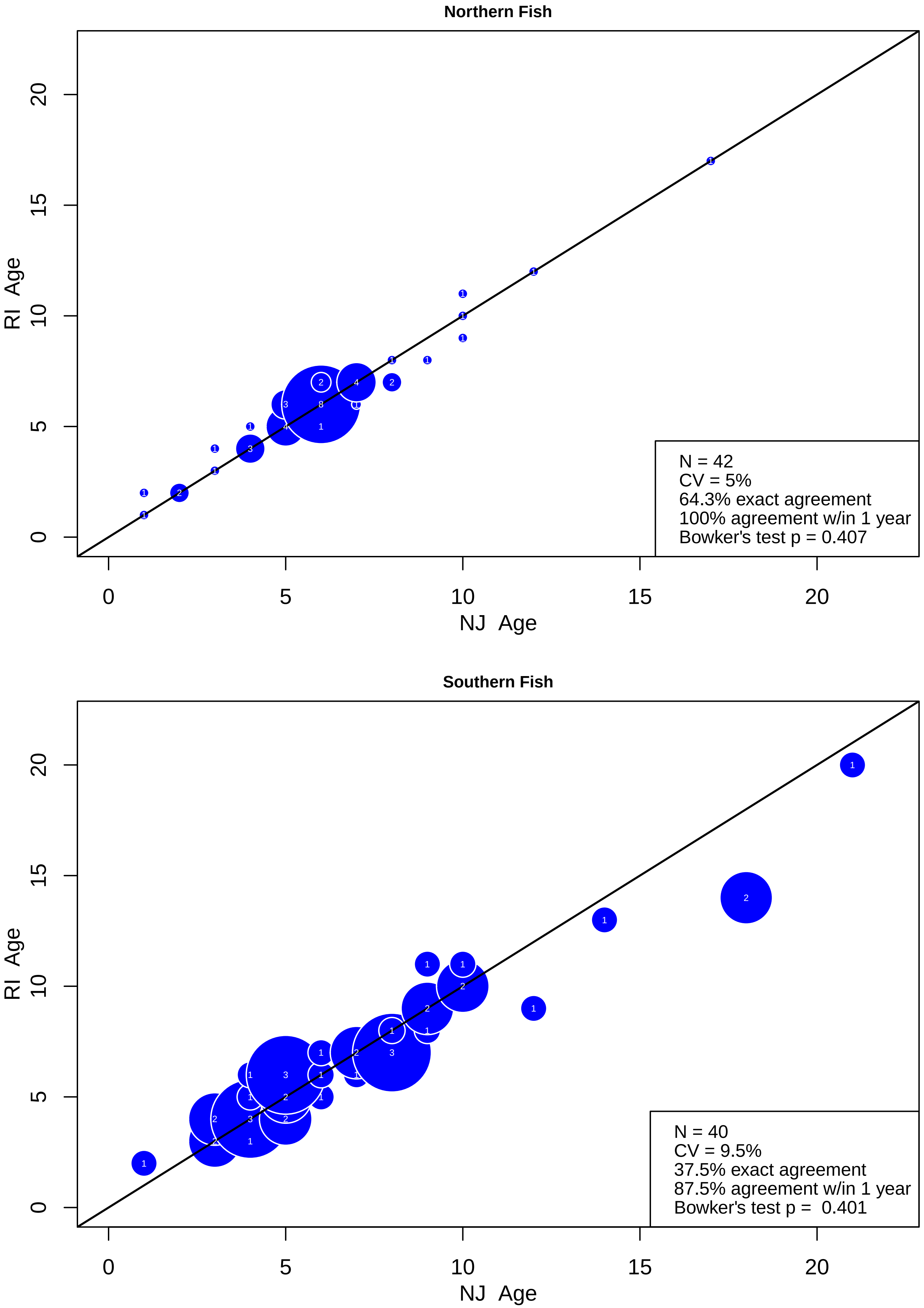
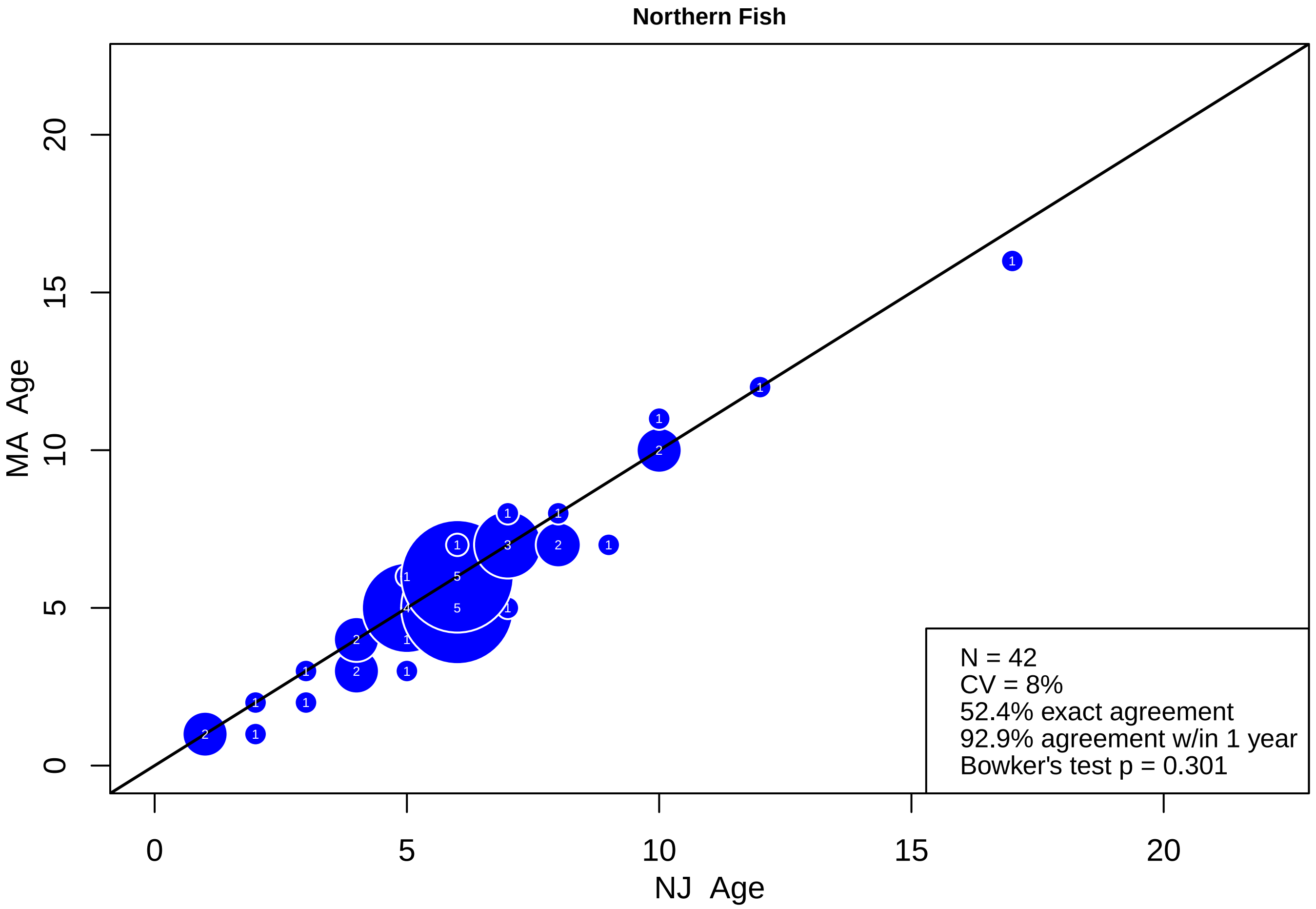


Figure 74: RI vs. NJ bias plots of operculum ages by region of sample origin.



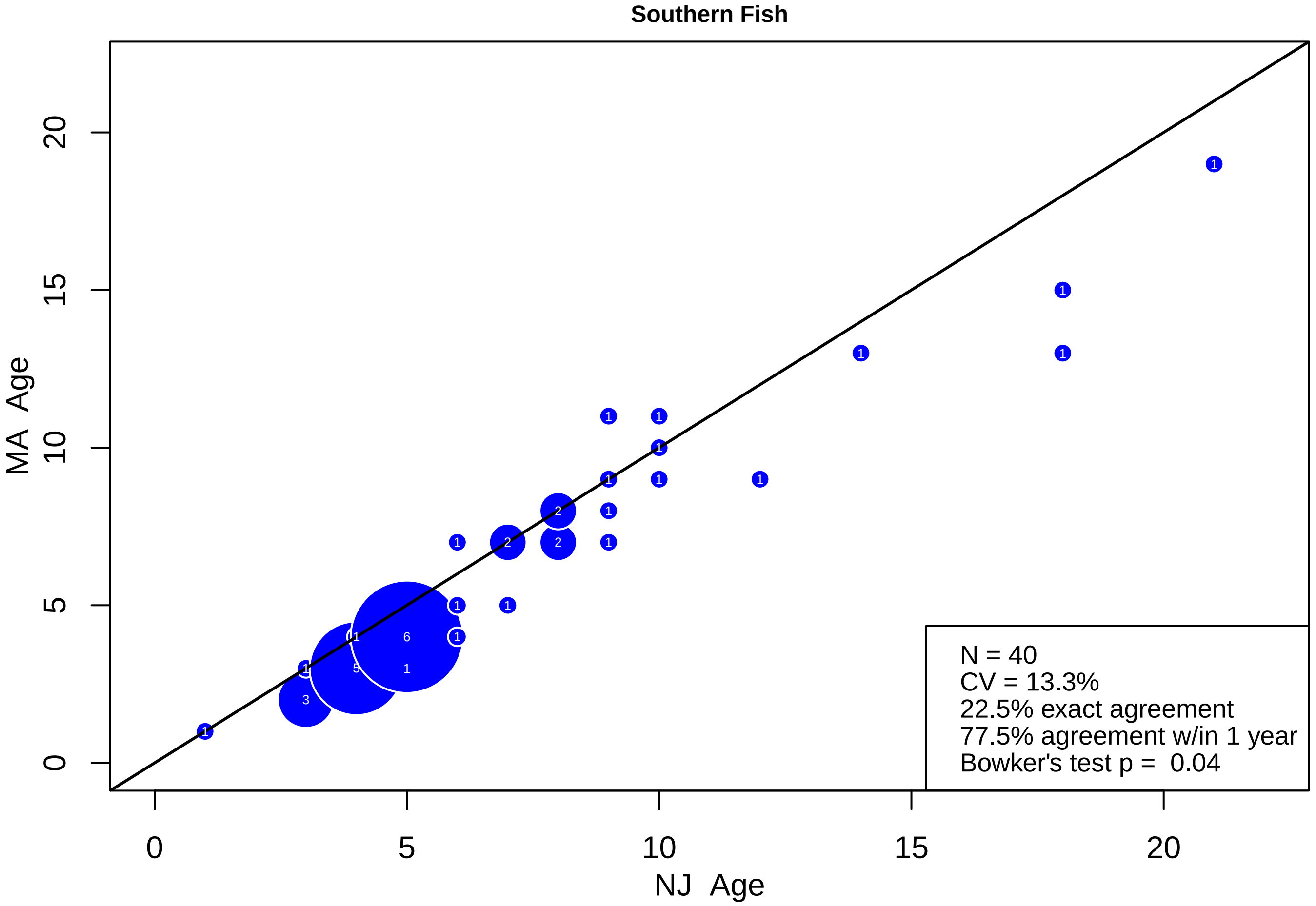


Figure 75: MA vs. NJ bias plots of operculum ages by region of sample origin.

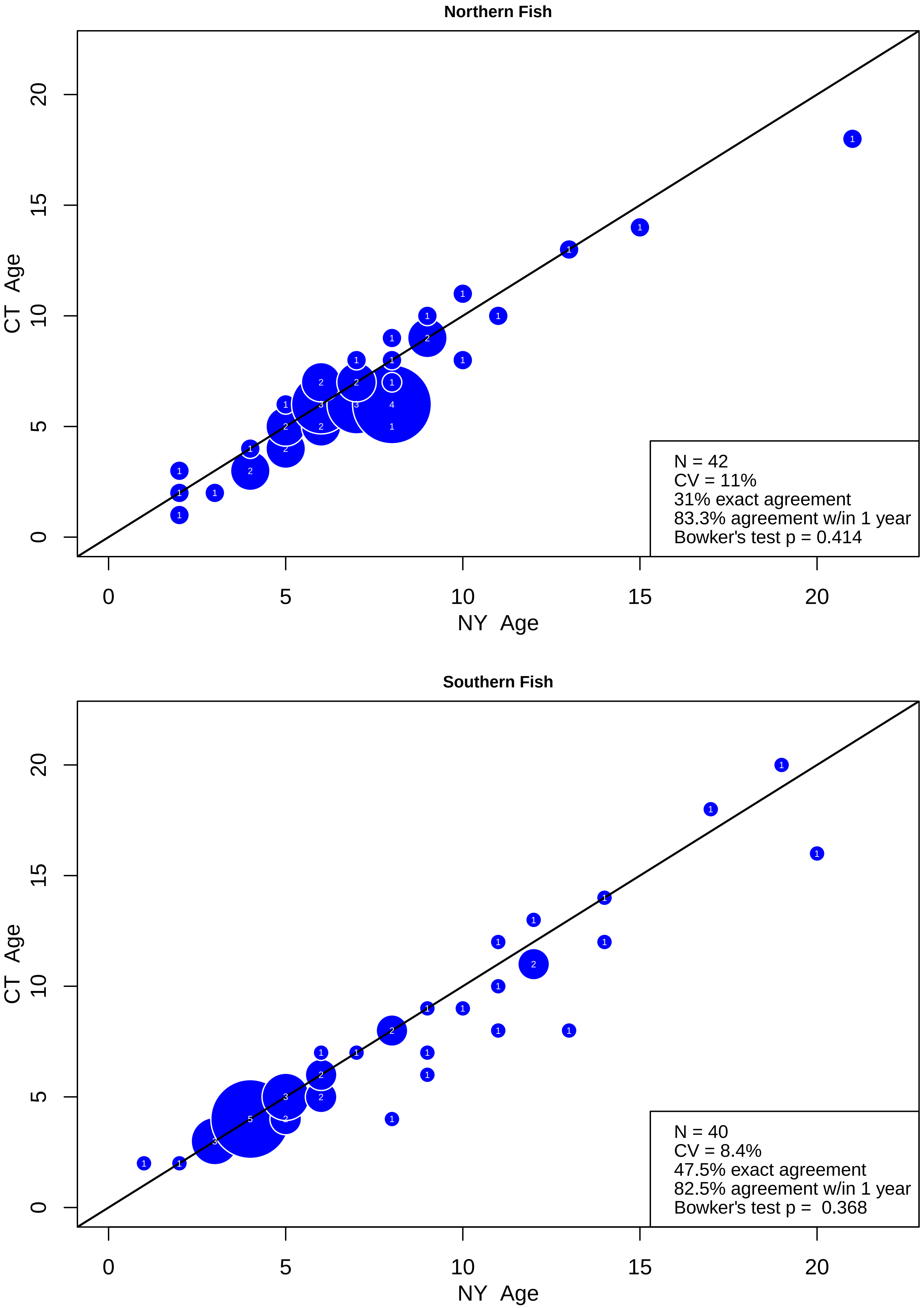
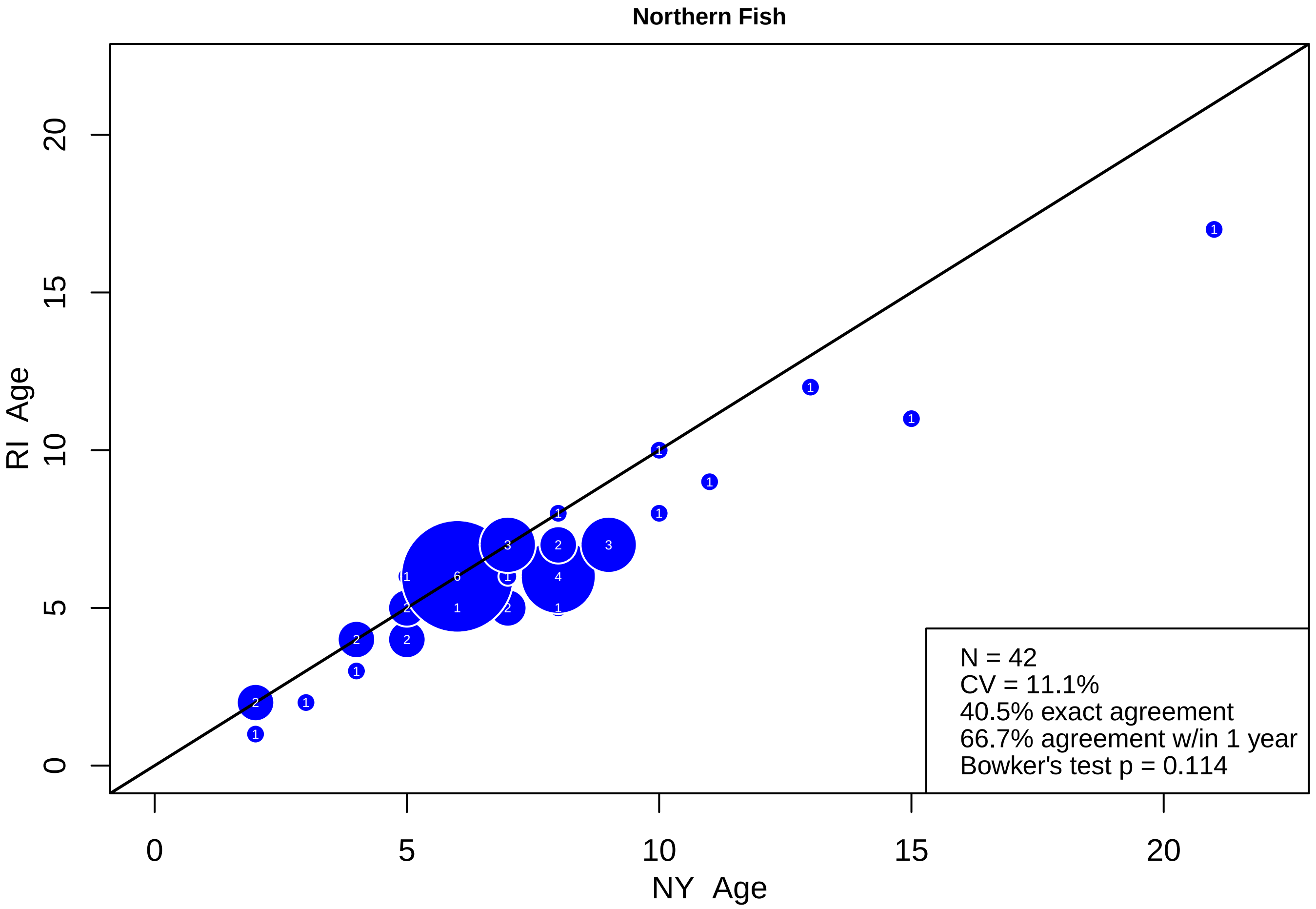


Figure 76: CT vs. NY bias plots of operculum ages by region of sample origin.



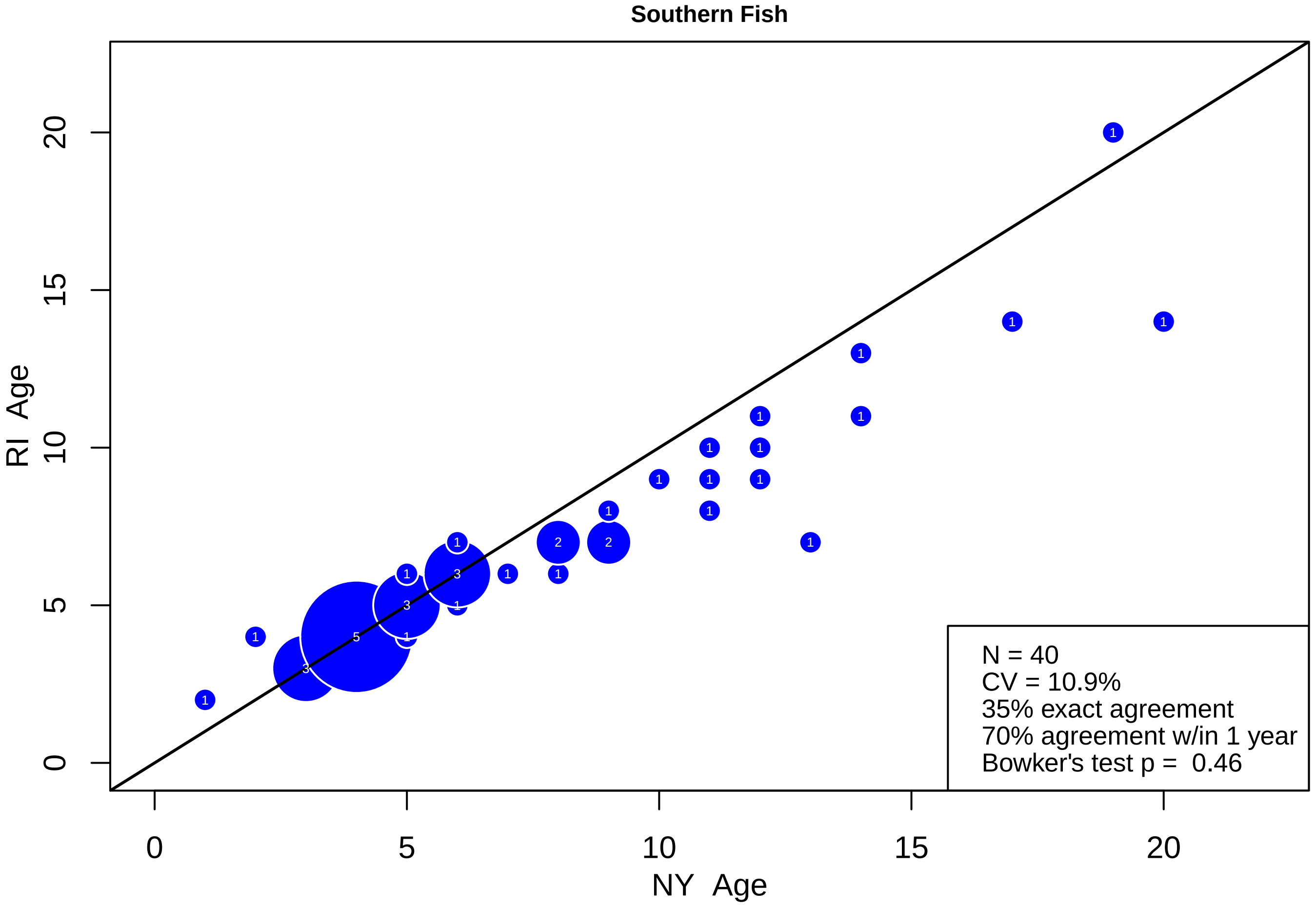


Figure 77: RI vs. NY bias plots of operculum ages by region of sample origin.

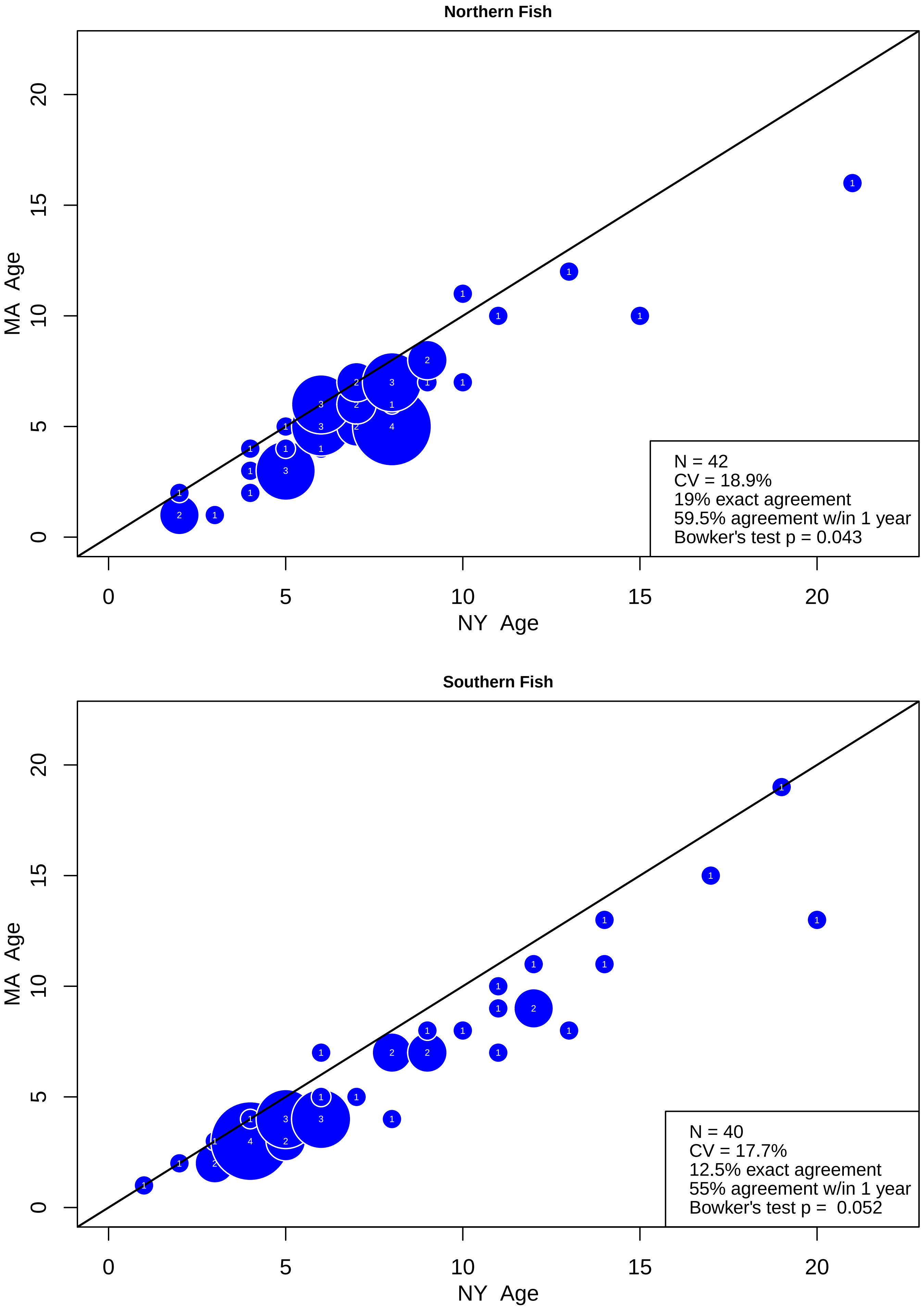
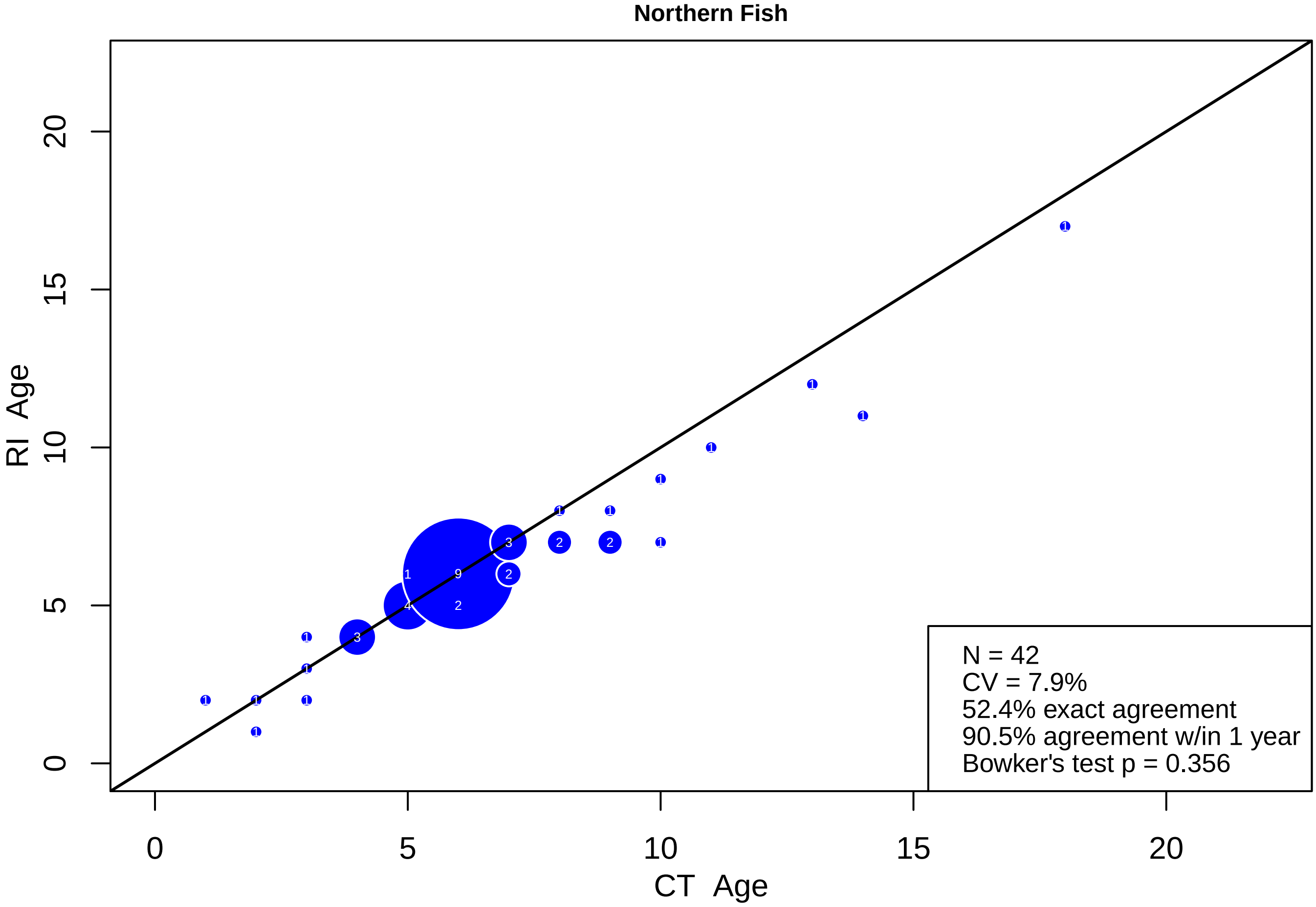


Figure 78: MA vs. NY bias plots of operculum ages by region of sample origin.



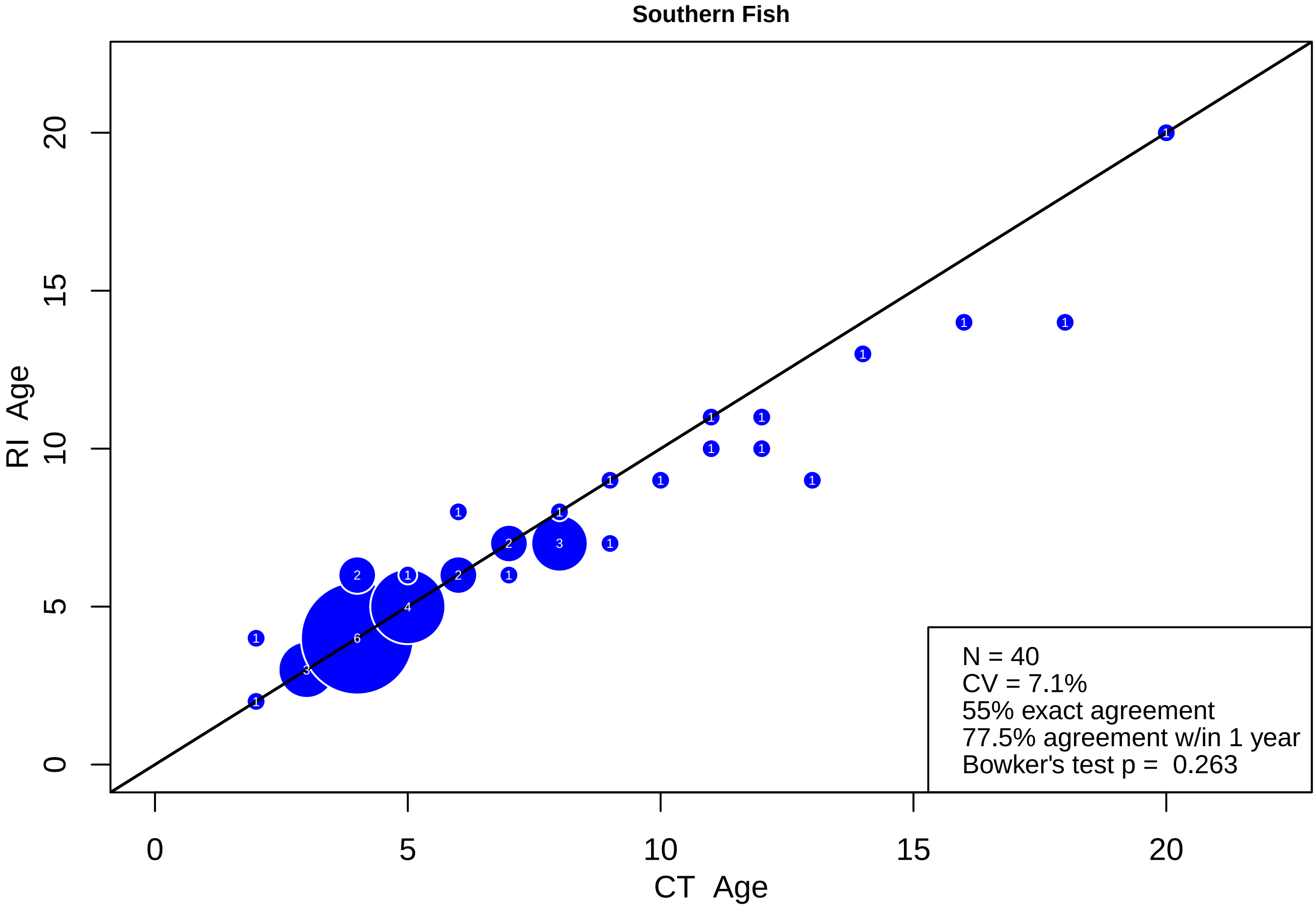
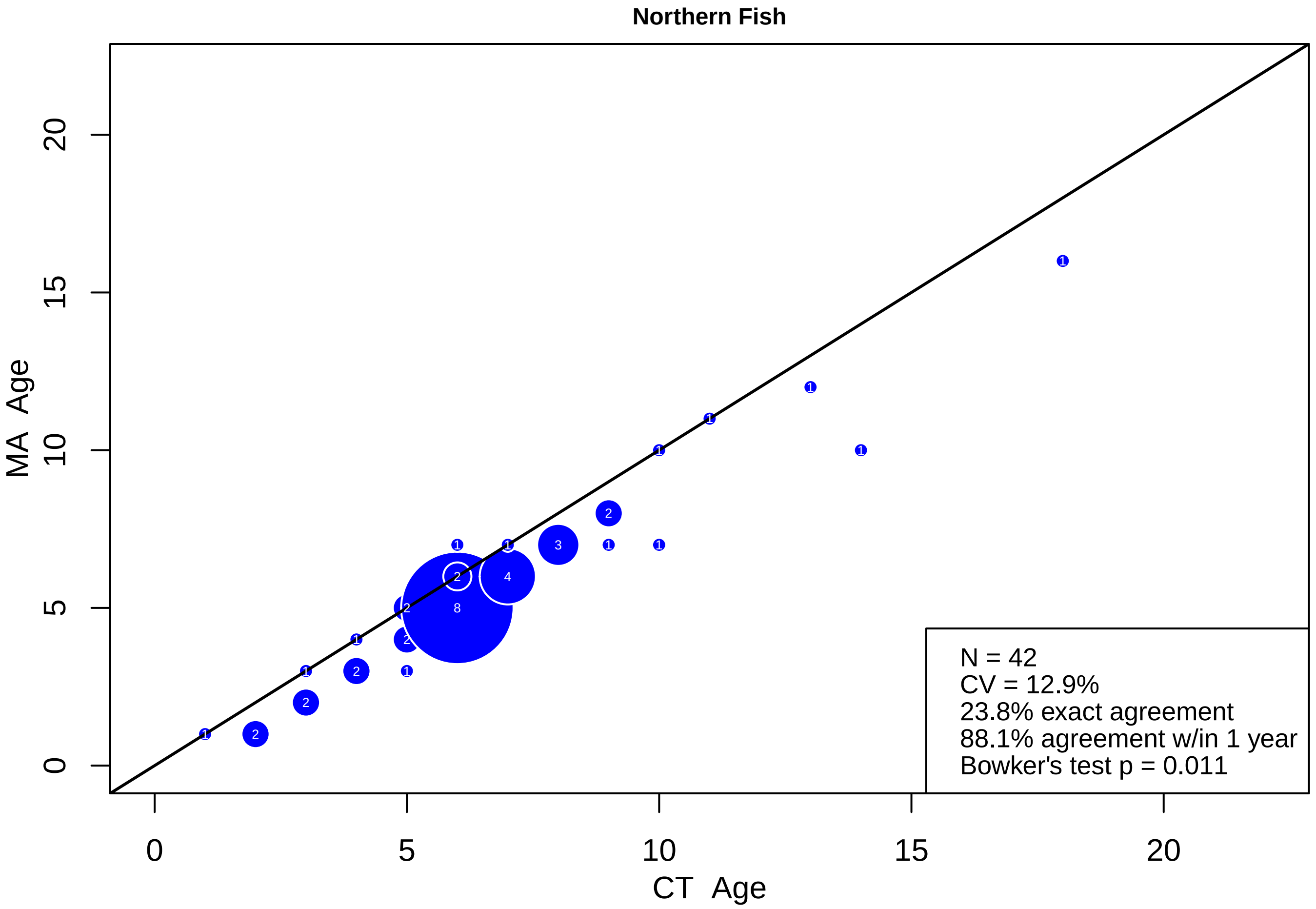


Figure 79: RI vs. CT bias plots of operculum ages by region of sample origin.



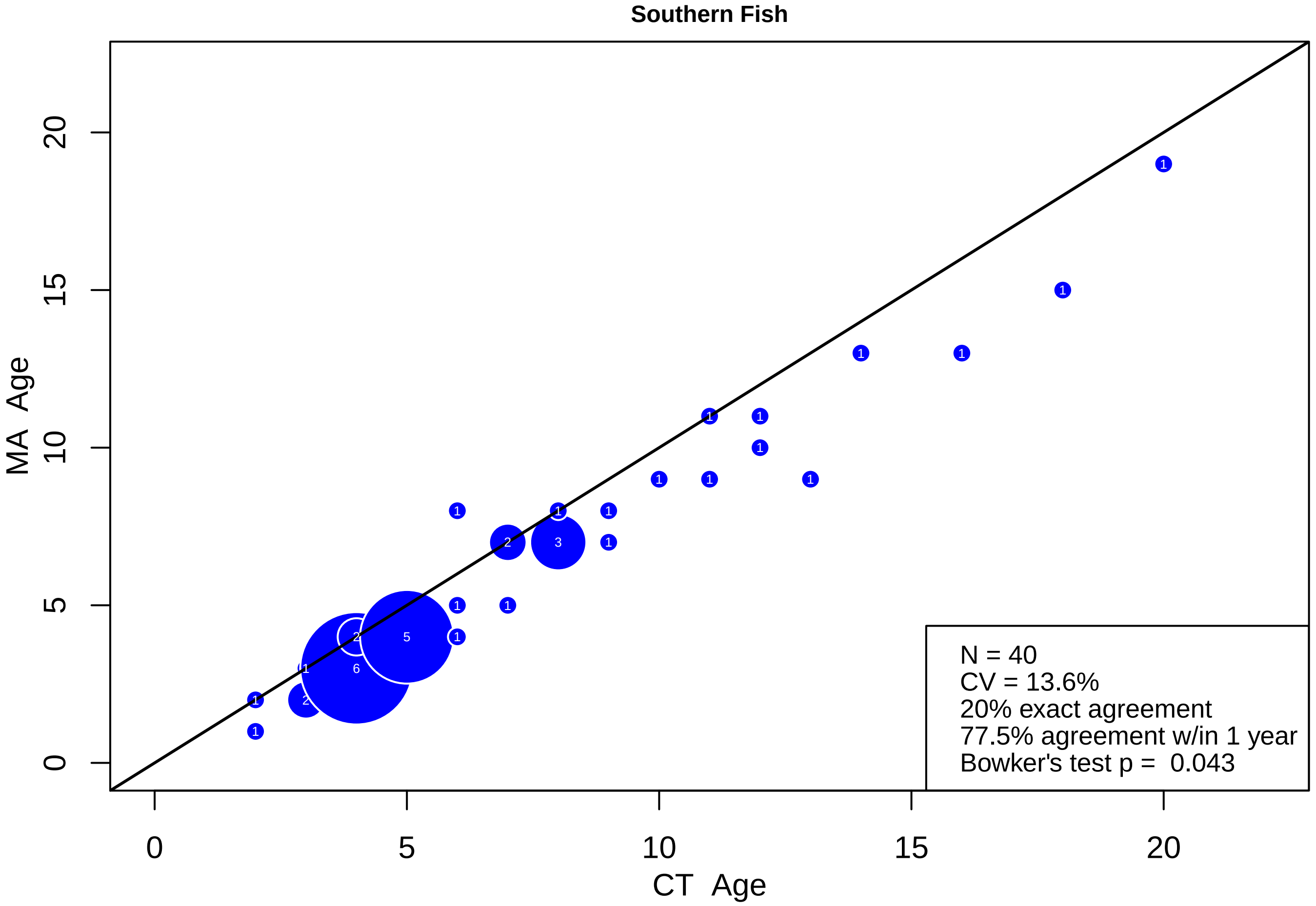
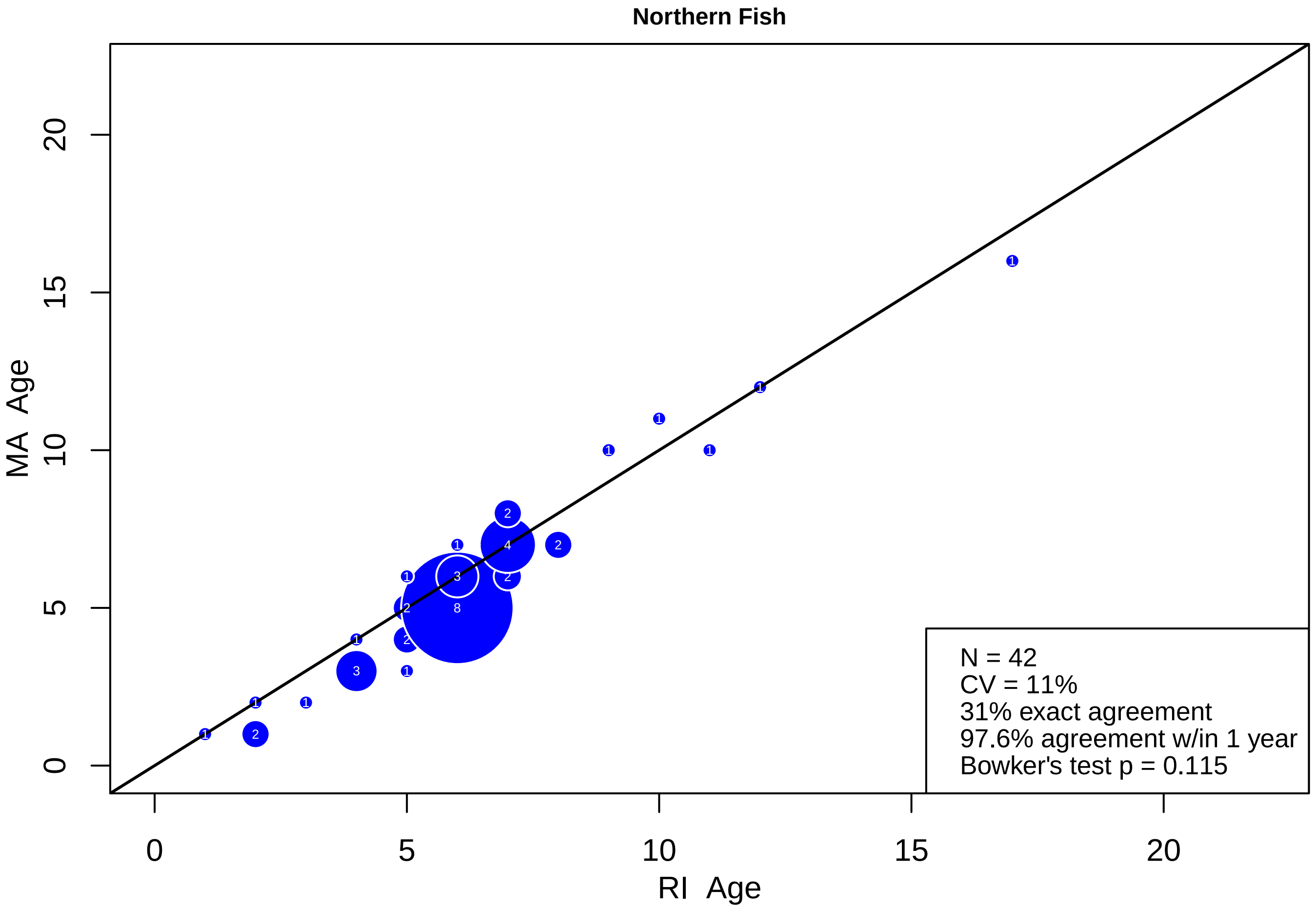


Figure 80: MA vs. CT bias plots of operculum ages by region of sample origin.



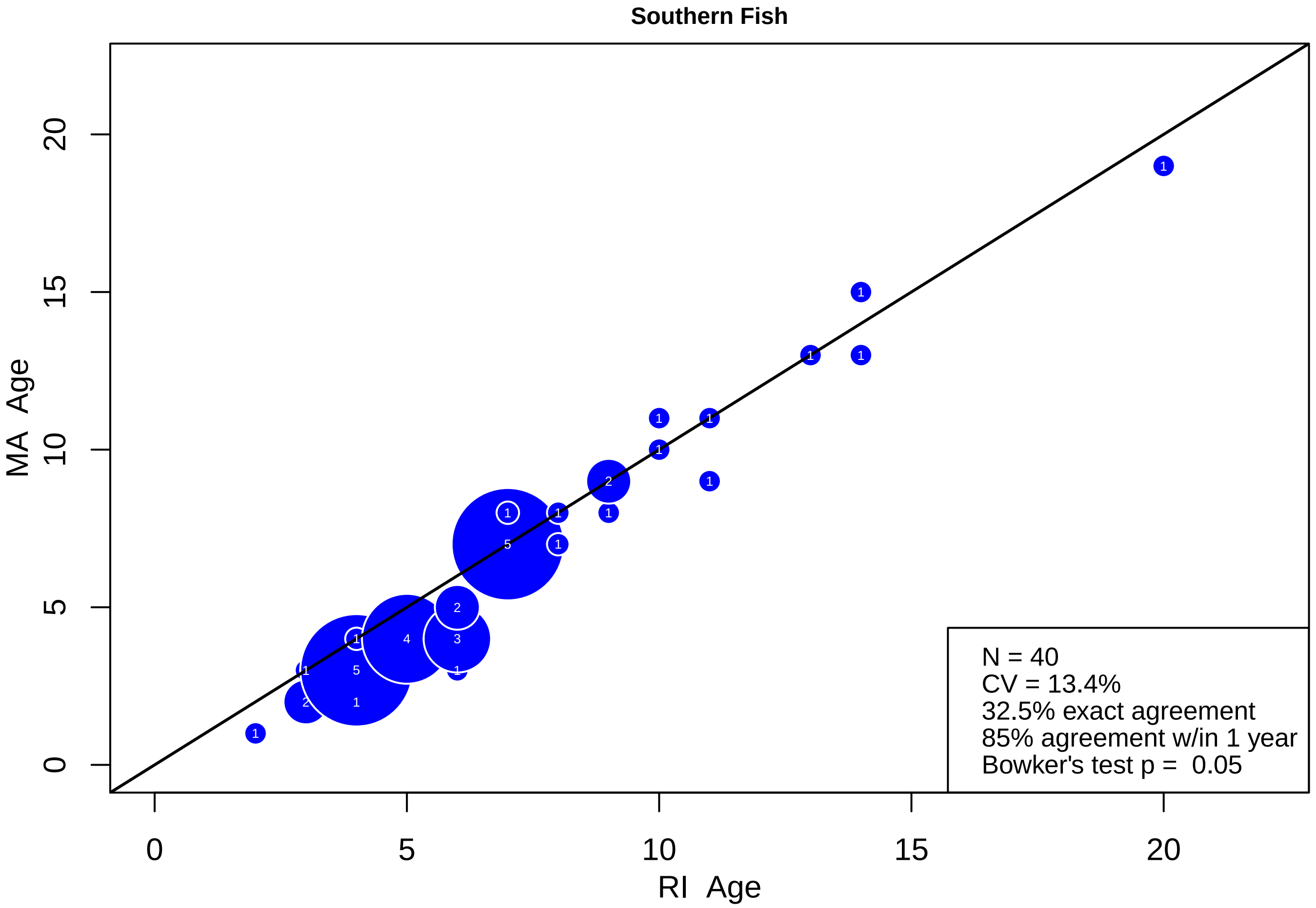


Figure 81: MA vs. RI bias plots of operculum ages by region of sample origin.

Appendix 1: Workshop and Hard Part Exchange Participants

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Tautog Assessment Scoping Workshop Report

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Baltimore, MD

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1 Workshop Motivation and Goals

Tautog last underwent a benchmark in 2005. Although the coastwide VPA used to assess the stock was accepted by the peer review panel for management use, several issues with the input data and model structure were identified (ASMFC 2006). In addition, concerns have increased at the Technical Committee and Management Board levels about the use of a coastwide assessment to manage a species as non-migratory as tautog.

Tautog is currently scheduled to undergo a benchmark assessment in 2014. This workshop was convened to review the available data and potential modeling approaches for tautog and develop a plan of attack for the upcoming benchmark assessment. Both the Tautog Technical Committee and Stock Assessment Subcommittee participated in the workshop.

2 Review of the 2005 Assessment

2.1 Data and Models

Recreational harvest makes up the majority of tautog removals. Recreational landings and discards were obtained from MRFSS, along with length frequency information. ALS data and state sampling have been used to supplement the low sample sizes from the MRFSS length samples for discards. Discard mortality was assumed to be 2.5%.

Commercial harvest data is obtained in aggregate pounds. Recreational mean harvest weight is used to convert commercial landings in pounds into number of fish; the recreational length frequency is assumed to represent the commercial fishery as well. There are insufficient commercial discard data or commercial catch length frequency data to characterize the commercial catch.

Regional age-length keys (MA-NY and NJ-VA) were used to convert length frequency data into catch-at-age.

Indices of recruitment and stock abundance from the Massachusetts spring trawl survey, the Rhode Island trawl survey, Connecticut trawl survey, New Jersey trawl survey and Rhode Island Coastal Ponds Seine Survey were used in the ADAPT model calibration. Age 1 indices from a local trawl survey conducted by the state of New York were also used in the input.

The assessment used the ADAPT VPA from the NMFS Toolbox. Natural mortality was assumed to be 0.15. In addition, some state-specific analyses – primarily catch-curves and a surplus production model for Rhode Island – were presented as well.

2.2 Peer Review Concerns and Recommendations

Although the Review Panel accepted the coastwide assessment as the best available scientific basis for management, they noted that some evidence was presented for sub-stock structure in tautog and that managing such a population on a coastwide basis may result in some sub-stocks being overexploited while others are not.

The Review Panel also raised concerns with some of the input data. The low sample sizes of lengths in the different fishery sectors results in low precision of the length and age composition of total removals. The recreational biosampling is used to describe the mean weight and length composition of the commercial catch, but this assumption has not been tested. The recreational discard mortality rate was based on a single study and is much lower than rates used for other species in the mid-Atlantic.

All of the fishery independent surveys used in the assessment are trawl surveys, and the Review Panel questioned whether the indices as presented are truly tracking population abundance, given that tautog prefers high-relief habitat which cannot be effectively trawled. The Review Panel recommended that statistical techniques such as GLMs be explored to remove seasonal and environmental effects that may be adding noise to the abundance signal. The Panel also recommended that future assessments should consider the use of the MRFSS CPUE if it can be developed as a reliable index.

The Review Panel had concerns about the VPA model structure, including dividing the state surveys into age-specific indices and assuming the catch-at-age data were known without error.

The Review Panel recommended that additional research be conducted on state-specific differences in size-at-age and maturity-at-age, as well as on recreational discard mortality rates. They also recommended that the current discard mortality rate assumptions be reviewed.

3 Progress Since the 2005 Assessment

The group reviewed progress that has been made in addressing the Review Panel's recommendations and identified new sources of data that should be brought to the table during the next assessment.

Several states, including MD, NJ, RI, and VA, have started or continued sampling of their commercial harvest which will allow us to validate the use of recreational catch sampling to describe the commercial fisheries.

Volunteer angler logbooks, ALS and other angler-based tagging program data, and state sampling were identified as possible sources of length frequency data to supplement MRFSS/MRIP.

NY has begun a fishery-independent pot survey that has been successful in catching tautog, although the time-series is still short (the pilot year was 2007).

The group endorsed the Review Panel's suggestion of using GLMs to standardize fishery independent indices with such factors as environmental data, season, weather events, and proximity to structure. The group also endorsed the exploration of the MRFSS/MRIP CPUE index, possibly using either directed trips or a species-association method to subset the MRFSS/MRIP intercepts. MD requires all headboats and charter boats to submit logbooks; developing a CPUE index from that dataset should also be considered. These fishery-dependent indices may be the only indices of abundance available for states south of NJ.

State seine survey data should be investigated as potential juvenile indices, if the surveys are conducted in lower bays and estuaries that are suitable juvenile tautog habitat.

A hard part exchange and an ageing workshop were conducted in the spring of 2012 to assess the consistency of age determination between states and the potential utility of otoliths instead of opercula to age tautog (ASMFC 2012). With one exception, which is being investigated further, there was no consistent pattern of bias between the states. Because VA had adopted a slightly different method of ageing tautog shortly before the last assessment, their most recent age samples were not included; the results of this workshop indicate their methods produce ages consistent with the other states, and their data should be included in the next assessment. The consistency of ageing between states means that age and length data from different states can be compared to investigate geographic differences in growth patterns. In addition, no significant bias was detected between otolith and operculum ages, indicating opercula are an acceptable ageing structure for the range of ages used in the assessment. Further work to validate historical consistency of ages is ongoing.

NEAMAP and ChesMMAP data were examined for potential use but not recommended as indices, given the low catch rates of tautog (NEAMAP caught a total of 17 tautog in 2011). NEAMAP may have length or maturity data for tautog that should be investigated further.

The group also recommended reexamining the NEFSC Trawl Survey and the URI GSO trawl survey as an index of abundance.

4 Potential Alternative Models for Tautog Stock Assessment

4.1 Statistical Catch-at-Age (SCAA) Model

A statistical catch-at-age model is a forward-projecting, age-structured model that allows estimation of fishing mortality and recruitment dynamics through a likelihood framework. This SCAA model addresses several of the issues with the VPA identified by the Review Panel. Most notably, the model does not require the assumption that catch is known without error; the likelihood framework allows the model to incorporate information on the precision of catch estimates. In addition, the SCAA model can be fit to an age-structured index without separating it into multiple, age-specific indices. It can also estimate uncertainty internally.

However, the SCAA model is still a data-intensive model, and the quality of the results is dependent on the quality of the input data, including the precision of the total catch, the precision of the catch-at-age, and the ability of the tuning indices to accurately track population abundance.

The NMFS Toolbox includes an SCAA model, ASAP, which is relatively flexible for an off-the-shelf model. It also has the benefit of being compatible with ADAPT VPA input files, which would save time in developing the inputs and make direct comparison of the two models easier. Building a custom SCAA model for tautog would take longer, but would allow the model to be specifically tailored to tautog population dynamics, including potentially spatial structure.

4.2 Data Poor Models

Three data poor models were also discussed: Depletion Corrected Average Catch (DCAC; MacCall 2009), Depletion-Based Stock Reduction Analysis (DBSRA; Dick and MacCall 2011), and Martell and Froese’s Simple Method (Martell and Froese, 2012).

These methods were developed to estimate sustainable yield for stocks where only catch data are available; DCAC and DBSRA are used on the west coast to establish OFLs for data-poor stocks like rockfish. These models use a similar approach: a time-series of catch and expert knowledge about stock productivity and status relative to an initial population size are used to estimate the maximum sustainable yield. Uncertainty around catch, stock status, and productivity are included in the MSY estimates through Monte Carlo techniques. The DBSRA model can be extended with the use of an index of abundance to estimate stock status; however, the other model formulations cannot provide status information, only management parameters.

These models are very simple to code and even with a large number of Monte Carlo runs, do not require much time to run. Developing the input parameters and their distributions is the more labor-intensive part of these models.

5 The Future of the Tautog Assessment

The recent development of new data-poor models makes a regional assessment approach more feasible. There are no fishery independent indices south of New Jersey, so a traditional assessment model like a surplus production model or an SCAA model cannot be applied for that region. Developing a fishery dependent CPUE from MRFSS/MRIP data would result in indices of abundance for all regions. However, these data-poor models may allow estimation of management parameters for states in the region, even without a reliable index of abundance.

Although tagging data indicate adult tautog do not move extensively, the few genetic studies that have been conducted have not been able to detect stock structure in the coastwide population. The question of how to define an appropriate sub-stock unit is still unresolved. The group discussed some possibilities, including a north-south split similar to the division that is used to create regional age-length keys, and a watershed-based split consisting of a Long Island Sound unit, a Delaware Bay unit, and a Chesapeake Bay unit. At the Data Workshop, tagging data, life history data, genetic data, and indices of abundance should be examined to determine the appropriate sub-stock divisions.

To a certain extent, the modeling approach used in the assessment will depend on how the stock units are defined. A more sophisticated, age-structured assessment may be possible for stock units that have both catch-at-age data and reliable indices of abundance, while stock units that only have catch data may have to rely on the data-poor methods. Multiple approaches should be explored for each region, and running the data-poor models in the more data-rich regions can provide a useful check on the performance of these models with tautog data. Other Commission species have used different modeling approaches for different stock units. For example, the Southern New England winter flounder stock is assessed with an SCAA model, the Georges Bank stock is assessed with a VPA, and the Gulf of Maine stock is assessed with an index-based method (swept-area biomass).

The data-poor models do not provide the same information as the age-structured assessment models, and different management strategies and reference points may be required for different regions. A successful regional assessment approach would most likely require an amendment to the Fishery Management Plan for tautog to take these differences into account and to allow the acceptance of the results for management use.

It should be stressed that while these models have the potential to improve management advice for tautog, the quality of the advice they offer is still dependent on the quality of the input data. Tautog is predominantly a recreationally caught species, and because it is rarely intercepted in the MRFSS/MRIP dockside surveys, the precision of the recreational catch estimates and length frequencies is very low, especially on smaller spatial scales.

The group discussed a preliminary timeline for a 2014 peer review. A planning call should be held in late 2012 to create a list of datasets and analyses to be brought to the Data Workshop. Prior to the Data Workshop, TC and SASC members are encouraged to investigate other potential sources of new data, such as academic research, power plant records, and historical data. The Data Workshop should be held in spring of 2013, to allow enough time for model development before an Assessment Workshop near the end of 2013. Assuming things go smoothly, the assessment should be ready for peer review in the summer of 2014. With this schedule, the terminal year of the assessment would be 2012. This means that the effects of recent management action to reduce F most likely won't be detectable by the assessment.

Tautog provides a number of challenges for assessment and management, but this benchmark assessment will give us the chance to explore new models and analysis to improve the quality of both the science and the management advice for this species.

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